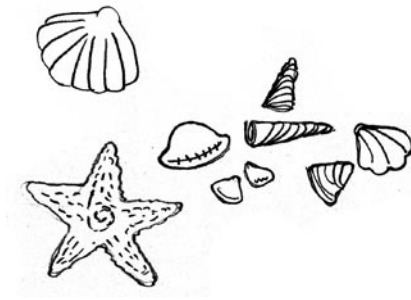


An activity book on Sandy Beaches and Sand Dunes for children

Sand in my Hands!





Credits

The conceptualisation, design and production of this book followed a field-based and collaborative approach and effort by teams at Handesign and the Coastal and Marine Programme (CMP), ATREE.

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How to use this book

This book is to help children, teachers and others to explore sandy beaches and sand dunes. It is a mixture of information, activity, fun and learning. It has been designed for adults and children to work together, to learn from the field and the community.

The teacher/educator should only act as the facilitator, encouraging children to ask questions and to look for answers themselves, through observations on the field and by talking to elders.

Encourage children to express themselves through drawing, writing, narrating stories and even poetry and drama. The book attempts at giving certain ways in which learning/teaching can be carried out, but the educator should feel free to invent his/her own ways.

Have fun!



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This symbol indicates an Activity

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1. This is Giri !

Giri is a boy who lives in **Akkaraipettai**, a little village in coastal **Tamil Nadu**, India. He loves the ocean and spends hours on end playing on the beach.

Giri will accompany us through this book as we learn about Sand Dunes and Sandy Beaches !

See Giri's village on the map on the next page.



ACTIVITY



Fill in the following
Tell Giri something about yourself !

My name is

I live in

in the state of

Does your village/town/city have a beach?

How far is the beach from your home?

Can you mark out where you live in the map of India given below?

Map not to scale

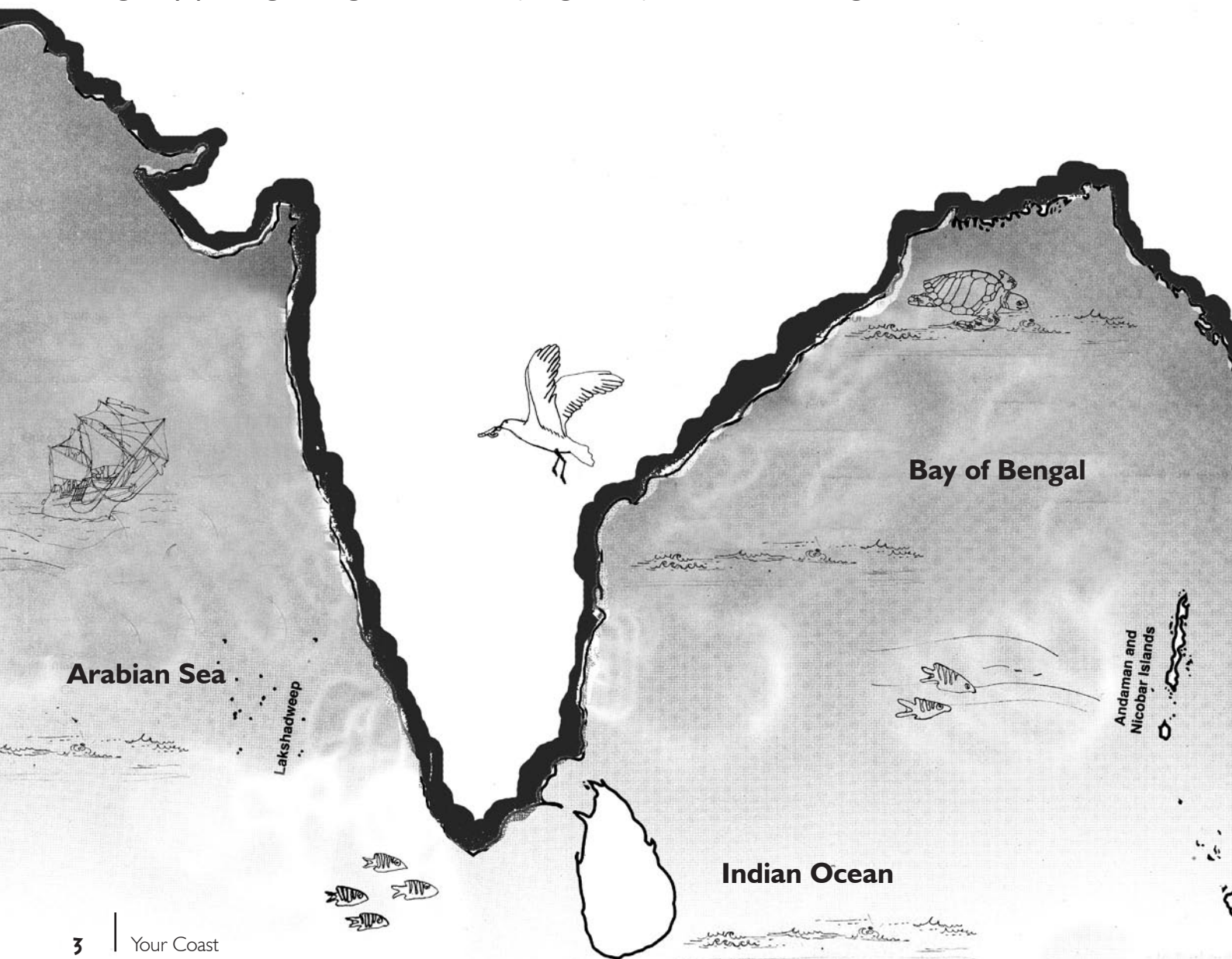


Colour the oceans & seas surrounding our country.
Can you name these water bodies?

2. Your Coast

India's coasts are special. All along its length - about 7,500 km - people live in large numbers. Nearly 250 million people live within 50 km from the coast! That is the shaded area on the map below. People live here even though the coast is sometimes not a very easy place to live in. Do you know how many cyclones hit the Bay of Bengal in the last 100 years? Over a thousand! And many of these damage property that people own and even put their lives in danger. Why do people continue to live in coastal areas?

Well, the coastal area is an amazing neighbourhood with very interesting neighbours! Where else will you find underwater building colonies (coral reefs), grassy parks growing underwater (seagrasses), trees with strange and visible roots



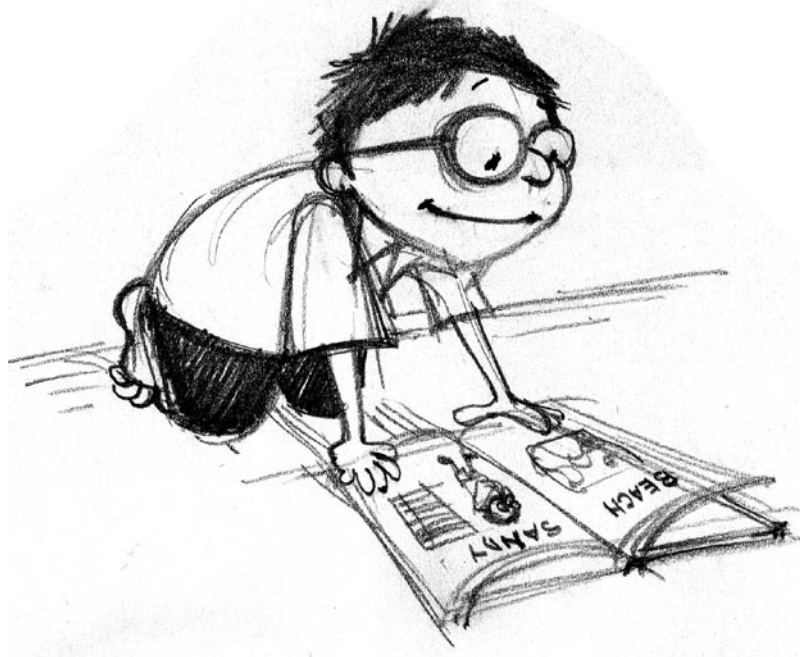
(mangroves), shores of rocks, sandy stretches (sandy beaches) and hillocks of sand (sand dunes). All of these neighbourhoods and the life forms that live in them quietly form a sort of protective shield against any harm that waves, storms or cyclones may bring. Each one is called an “ecosystem” - a kind of neighbourhood by itself. Not much is known about these ecosystems, or who lives in them, or why they are important. Through this book, we try to understand two of these coastal neighbours better - Sandy Beaches and Sand Dunes.

In December 2004, a strong earthquake in the country of Indonesia caused a giant wave to come flowing all the way to India. In Tamil Nadu, where these wonderful ecosystems like sand dunes no longer existed, the tsunami caused a lot of damage. People died and their homes and their lands were badly damaged.

Coastal people and fisherfolk in these areas remembered the importance of sand dunes and sandy beaches, in protecting them from the power of the waves. Even though they live so close to the salty ocean, the water they get in their wells is sweet! This was because the sand dunes magically stopped the salt water from mixing with the sweet water.

In many parts of the coast, and even in other parts of the country people are beginning to respect these ecosystems. They now know that that it is a part of the coastal peoples' lives.

But, in other places, sandy beaches and sand dunes are still being destroyed and we are exposing ourselves to the destructive forces of the oceans. Let us learn more about these systems so that we can help people protect themselves.



ACTIVITY

2



My Coast ! My Beach ! My Dunes !

Have you ever been to a beach? When did you go last? Where is this beach? Did it have sand dunes ? **Write about your experience in the space below.**

Remember to think about the following : • Why did you visit the beach ? • How often do you go ? • What did you do there ? • What was it like ? • What all did you see ? • What did you hear? • Who all were with you ?

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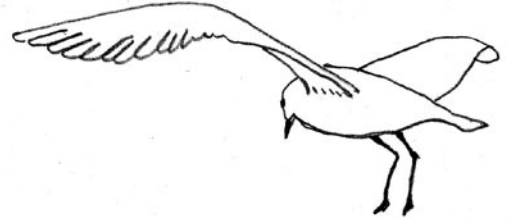
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Draw pictures of 5 things you saw at the beach...



Maps !

You must have seen maps on the television or in newspapers. Your Geography Book is full of maps. A map can be drawn about anything you want. It is a representation on paper of the things that you see around you.

In general, a good map includes a:

- **Title:** This tells you what the map is a representation of.
- **Date:** This helps the person reading the map to understand when the map has been drawn.
- **Legend:** This is a key telling the reader the meaning of the symbols that the map-maker (cartographer) has used to represent different things on the map.
- **Orientation:** This marks the directions on the map - north, south, east & west.

Reading a map !

Look at the map on the following page, and use its legend to spot the following :

- Sea • Beach • *Casuarina* plantations
- Village • River • Paddy fields • Sand Dunes

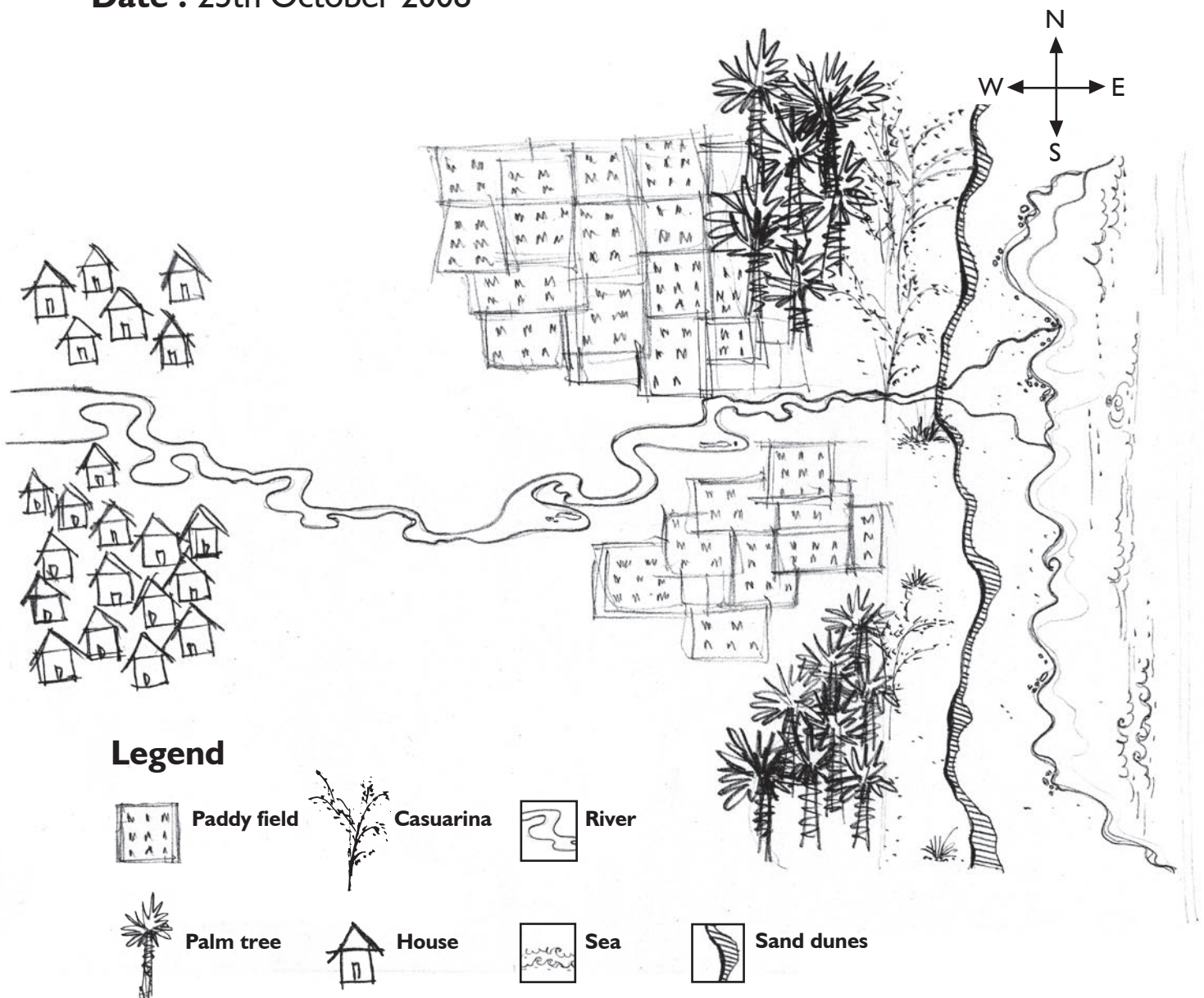
Can you examine the map closely and say whether this place is on the east coast or the west coast of India ? How can you tell?

(Hint: Use the orientation of the map!)



Title : Layout of Village, Tamil Nadu
Date : 25th October 2008

Orientation



Draw your own map !

With the help of your teacher, draw a map of the path that you would take from your village to the beach. Make sure you use a large sized piece of paper. You can work in small groups of 2-3 people.



What are the different things that you see along the way (buildings, trees, fields, shops) ? Draw each of them carefully. Make sure your map has a **Title**, a **Date**, a **Legend** and an **Orientation** marked.

Put your map up on a wall of the classroom for everyone to see.

3. The Elements that Shape our Shores



Waves

Where do waves come from, how are they formed? Wind blowing over the sea-surface creates a friction and drags on the water below. When the wind action becomes strong, the drag increases and waves are formed.

Some winds make waves hit the shore at an angle. These waves bring sand to the beaches.

Waves can create and waves can destroy. Each passing wave moves the sand around changing the shape and slope of the beach.

During storms and cyclones, waves smash on the beaches directly and tear away a large amount of sand and also other objects on the coast. Such waves cause large scale erosion on the beaches.

Winds

Winds are one of the most powerful and mysterious of nature's wonders. Winds cause waves; sailors use them to sail; you use them to fly kites and nowadays they are also used to generate electricity through wind turbines.

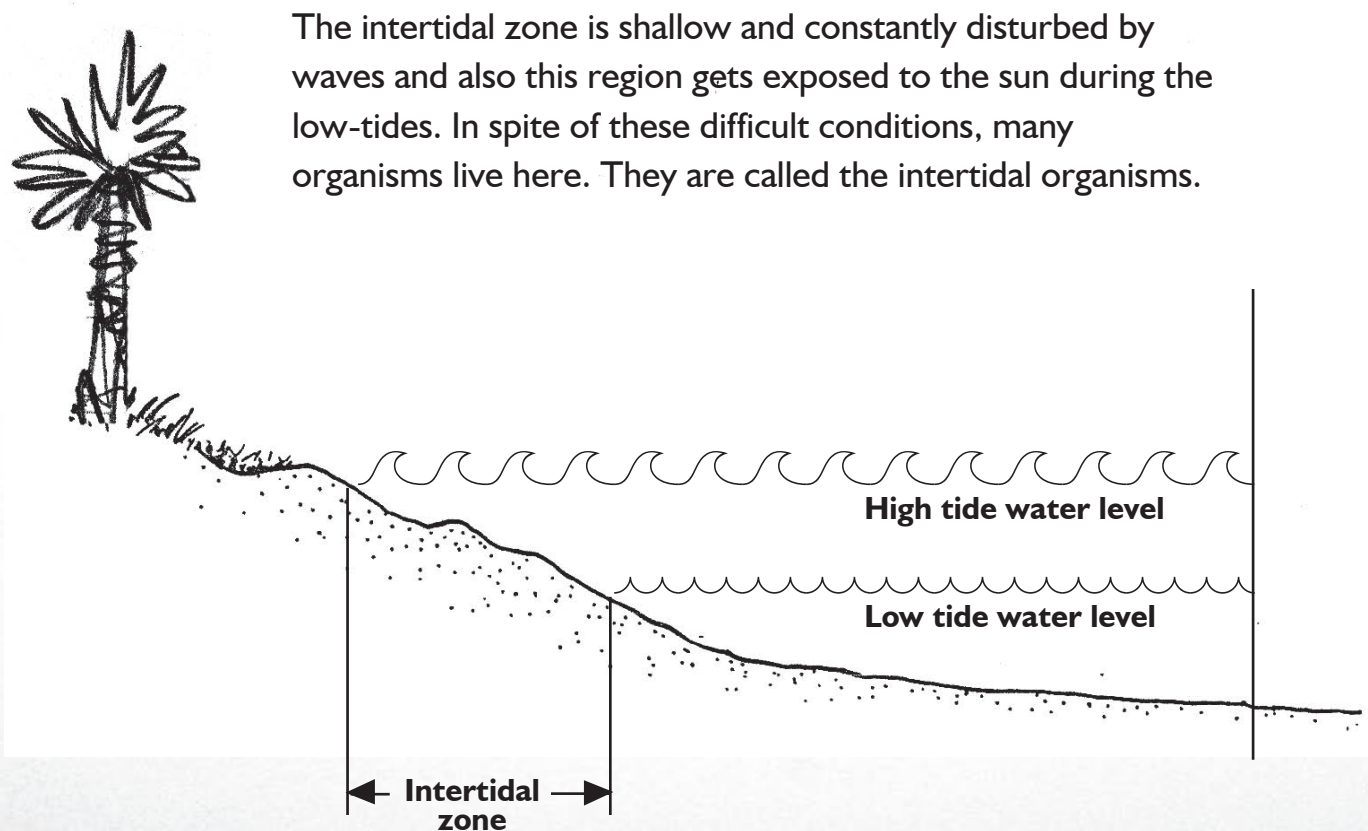
Tides

Tides are the periodic rise and fall of large bodies of water like the sea. Tides are caused by the gravitational pull of the moon and the sun. The gravitational attraction of the moon causes water to bulge. The bulge causes water level to rise and is generally called the 'High Tide'. When the moon moves away, the water slowly recedes and this is called the Low Tide. Tides are highly predictable.



The Intertidal Zone

When you go to a beach sometimes, you may observe that the level of water has gone much further down than what it was a few hours before. You may even notice that there is a line running along on the beach, above which the sand is dry and below which the sand is moist. This line is called the 'drift line'. The strip of land that alternately gets submerged and exposed with the rise and fall of the tide is called as the Intertidal zone.



ACTIVITY

5



The Elements & Fisherfolk !

The elements have special importance for fisherfolk. They have to be able to read them well. Their very livelihood and lives depend on it.

Interview a fisherman from your village to understand how the three elements - waves, winds and tides, affect their lives.

First make a list of the questions you want to ask. You can add to the ones given below. Remember doing a good interview requires some thought and planning !

Waves

1. How are waves formed ?
2. What are the waves like far away from the shore?
3. How do the boats stay afloat inspite of the strong waves?
4. Why are the waves sometimes strong and sometimes gentle?
5. Do waves affect fishing activity? How?

What other questions do you have about waves? Add these below:

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Winds

1. Where do winds come from ?
2. What directions do they blow in?
3. What are the patterns in wind flow in your region ?
4. What all can you understand from the how the wind blows ?
5. How do winds affect fishing ?

What other questions do you have about winds? Add these below:

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Tides

1. Why do tides occur ?
2. When are tides the strongest and when are they weak ?
3. Do you know any stories / myths that relate to tides?
4. Why are tides cyclical?
5. What relevance do tides have for fishing ?

What other questions do you have about tides? Add these below:

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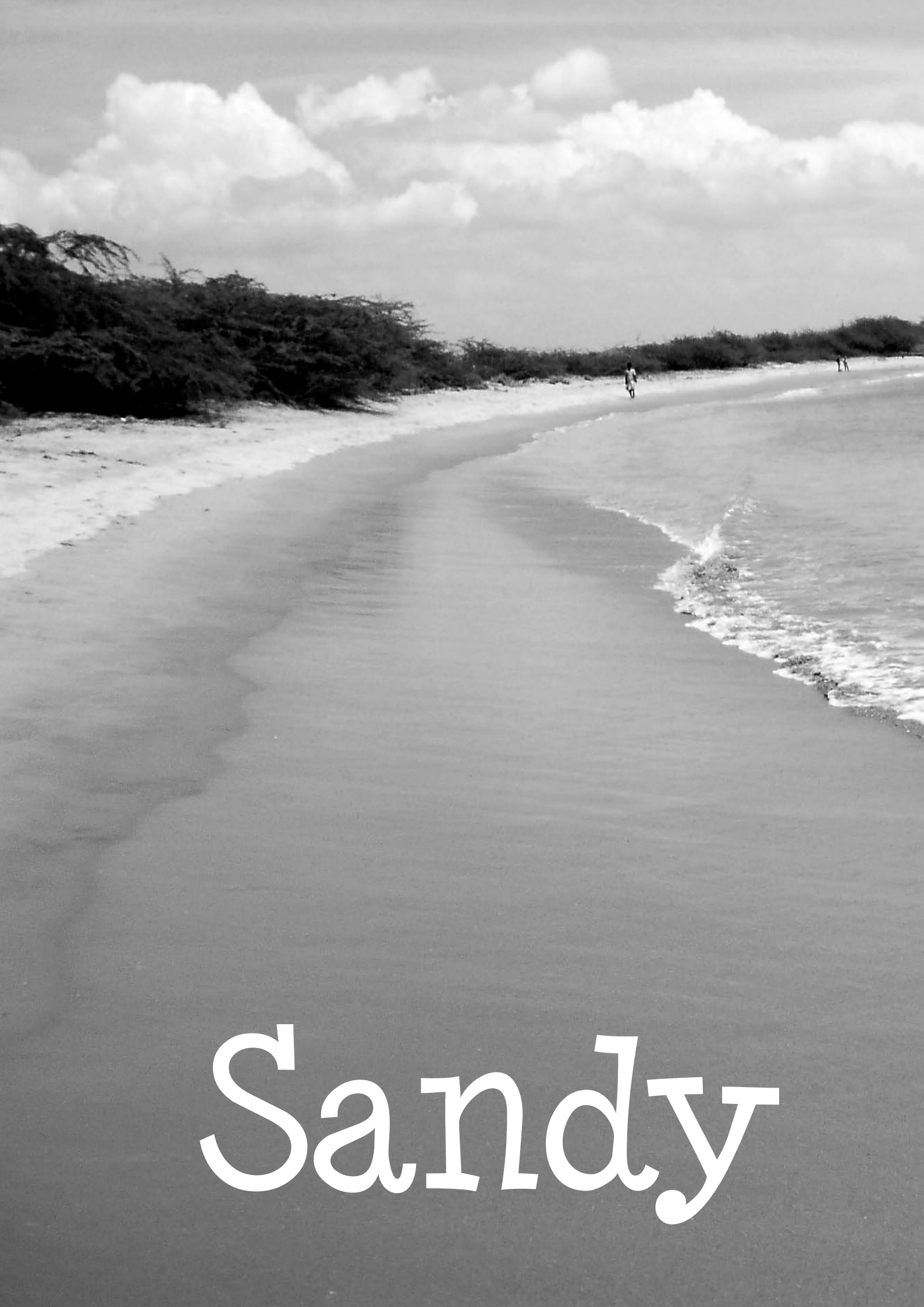
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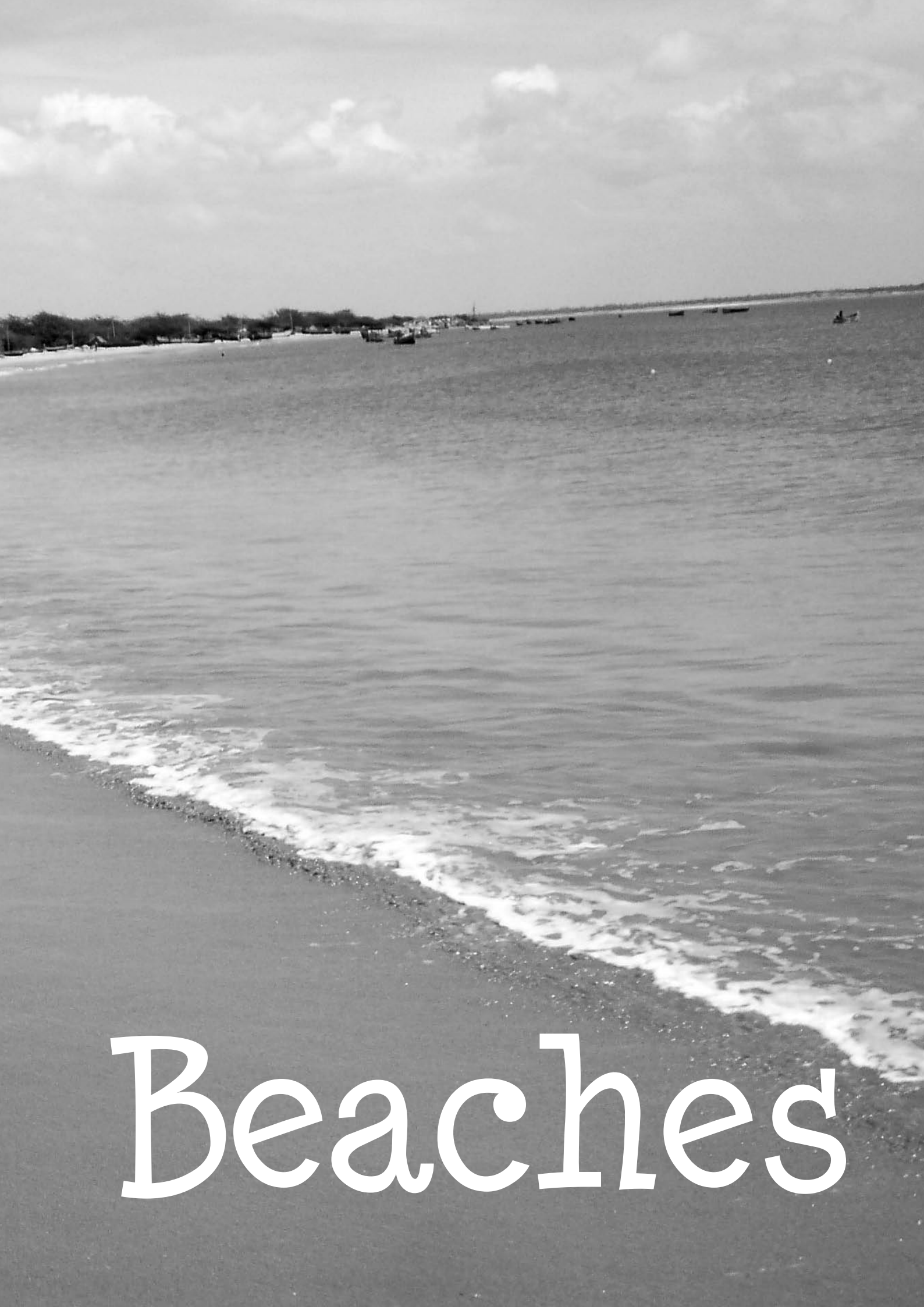
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**Now do your interviews using the above list of questions.
Make a note of all that you learn and share it with your class.**



Sandy

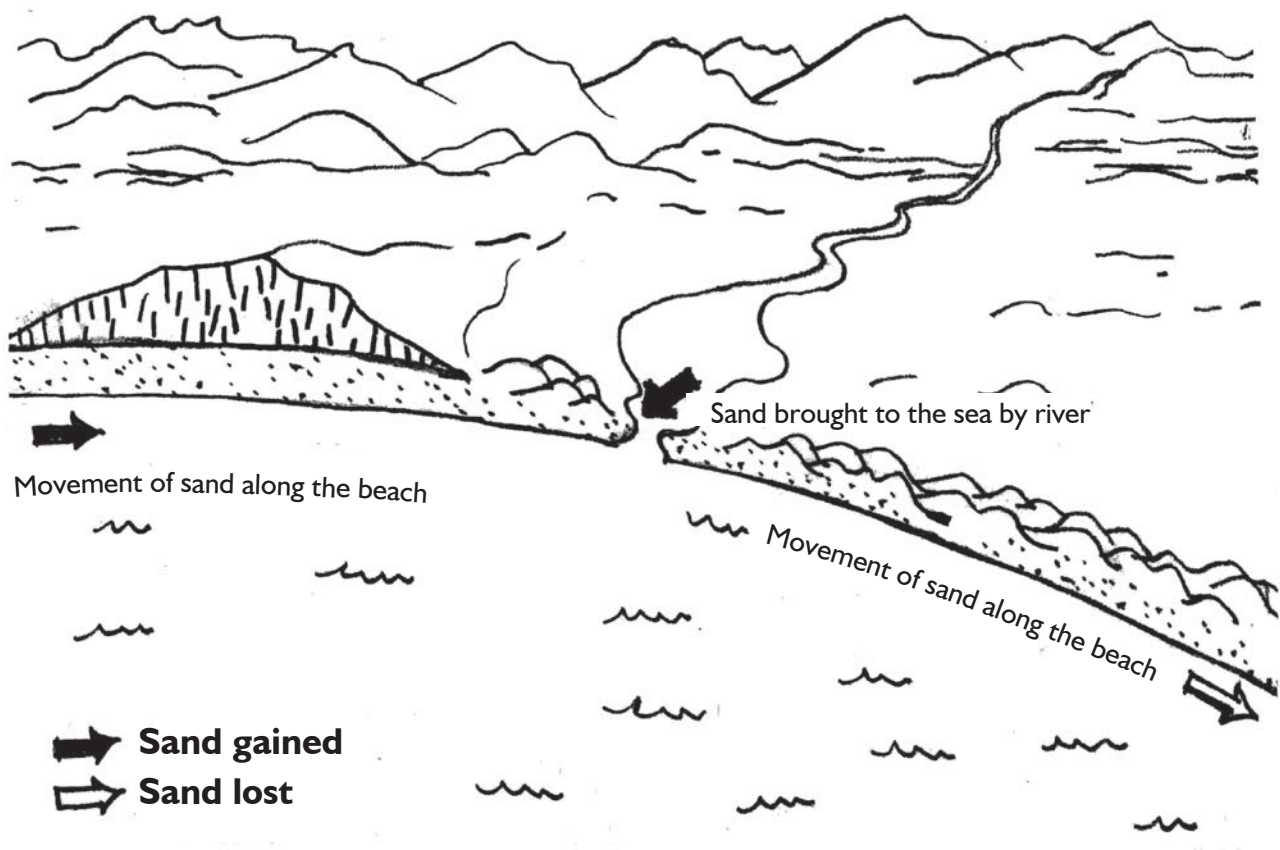


Beaches

4. Sandy Beaches

How is a Sandy Beach Formed?

Have you ever wondered where the large amount of sand on the beaches come from? When the rain begins, large amounts of sand from hills, mountains, fields, plains etc are washed away and carried to rivers. The rivers in turn carry these huge amounts of silt and sand to the sea. When the sand reaches the sea, waves and currents in the sea carry the sand along the beach and gradually, deposit them on to the beaches. Every year, waves take away a large amount of sand from the beach and also deposit a large amount on the beaches. Beaches may take years or centuries to form. One large storm is capable of removing a lot of sand from the beach, eroding it. But the sand quickly gets deposited back and if left undisturbed, the beaches come back to their earlier state in a few years time.



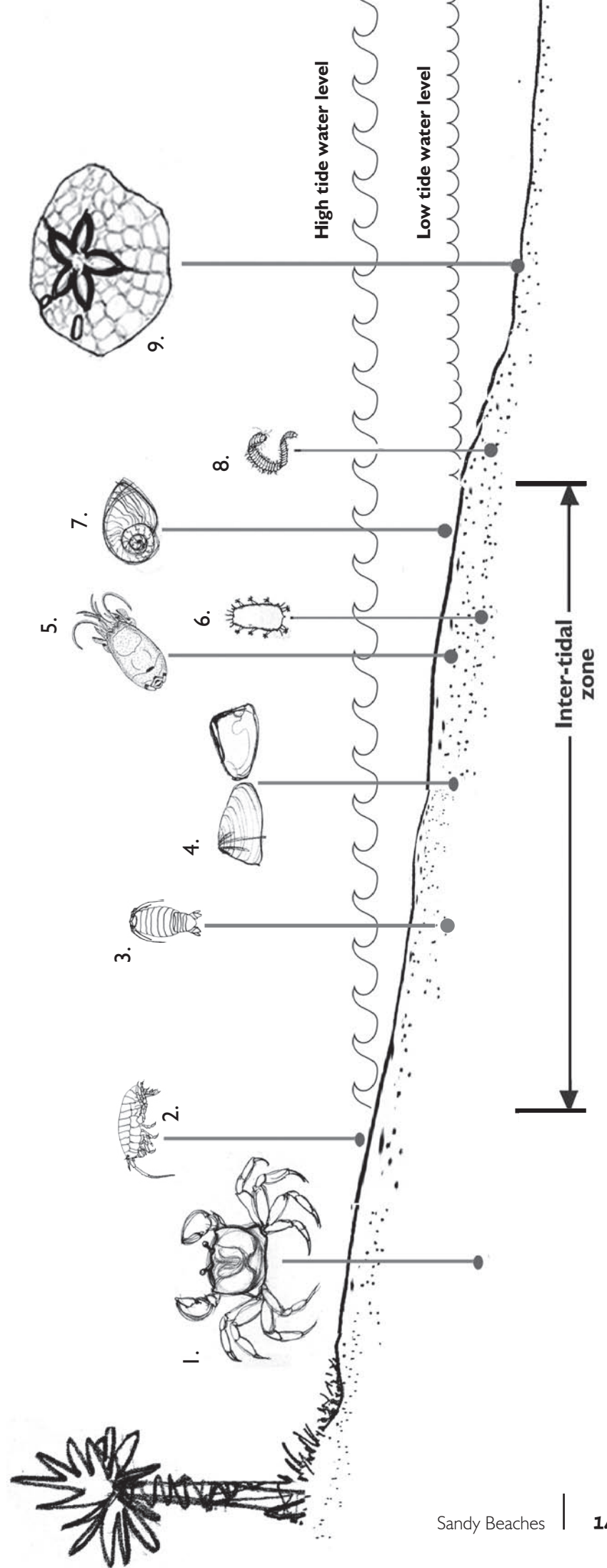
Formation of sandy beaches

Life on Sandy Beaches

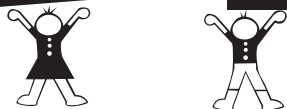
Do you see any living organisms as you walk on to the beach? To a casual observer the sandy beaches may seem completely devoid of life. But this is because the animals are either very small or are burrowed in sand only to come out during the high tide. The whole sand on the beach where the water can reach up to is full of thousands of tiny creatures invisible to the naked eye. Some are so small that they are able to live in between the grains of sand.



1. Ghost Crab
2. Talitrius
3. Excirolana
4. Bean Clam
5. Mole Crab
6. Tardigrada
7. Lined Moon Shell
8. Polycheate
9. Sand Dollar



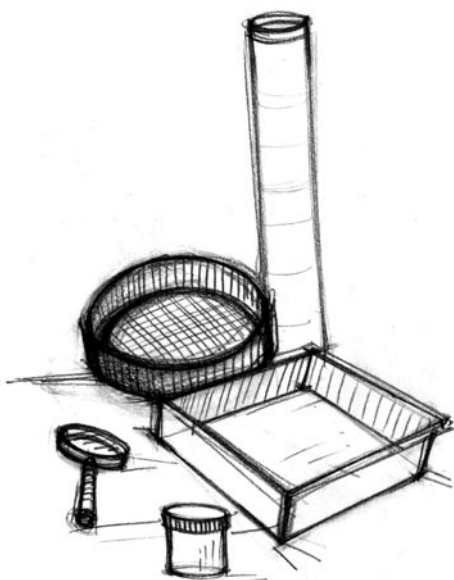
ACTIVITY SIX



Little creatures of the beach !

The beach is home to thousands of tiny creatures that are hard to spot with your eyes. In this activity you will discover this world !

This activity requires involvement and supervision by a teacher.



Equipment needed:

- PVC pipe or strong cylindrical pipe of 10 cm diameter and at least 30 cm height
- A mesh with holes of about 0.5 millimetres (A fine mosquito net or a sieve used for sieving flour should do)
- Small plastic containers (5-10)
- A magnifying glass
- One large plastic tray and one smaller white plastic tray
- A pair of forceps

Divide yourself into groups of five or six. Find a spot on the beach without much wave action but where the seawater can reach. Push the pipe about 10 centimetres into the sand. Quickly dig around the pipe and slowly tilt the pipe ensuring that sand within the pipe does not fall out. Empty all the sand in the pipe into the large plastic tray. Put a small quantity (about one sixth) of the sand in the sieve and gently start sieving in water. Take special care not to dip the sieve entirely in water. Keep the top of the sieve above the water level. Once you attain some practice, sieve more vigorously. If using a mosquito net, hold the net so that sand does not escape from the sides. Hold it like a bag and dip the bag in seawater and shake vigorously. Once you have sieved for five to ten minutes, empty the remaining sand into a white plastic tray. Spread the remaining sand on the tray gently and observe the material in the tray with a magnifying glass.

Did you find anything interesting in the tray? You may also try adding a little bit of water just to immerse the sand. There could be shells, tiny creatures darting around, small slender worm like creatures, slightly pinkish things etc. Try and remove the excess sand without disturbing the organisms. Put the remaining stuff in a plastic container. If you have a microscope at school, take them quickly to the laboratory and observe them under the microscope. The organisms you see here are intertidal organisms. You will learn more about them in the next few pages.

1. Did you encounter any organisms? If so how many?

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2. Do they look like any of the creatures shown in the pictures on page 17 & 18?
Try and name them.

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3. Record which part of the beach you found them.

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4. Compare what your group has found with what the others found.
Is there a difference? If so what could be the reason?

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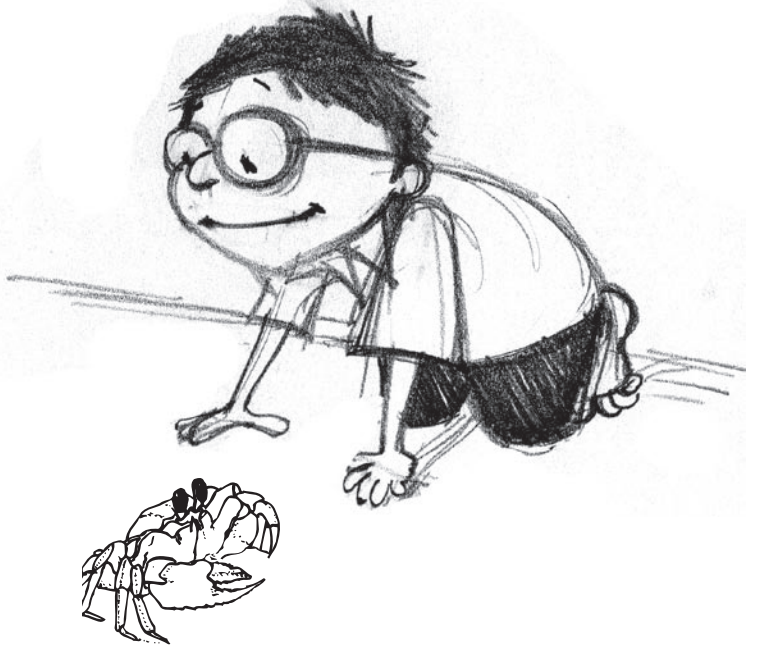
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Adaptations of Intertidal Organisms

The tides are highly predictable and this induces a certain rhythm in the activities of beach organisms found in the intertidal zone. All intertidal organisms need water to survive. They have to adapt to two major conditions

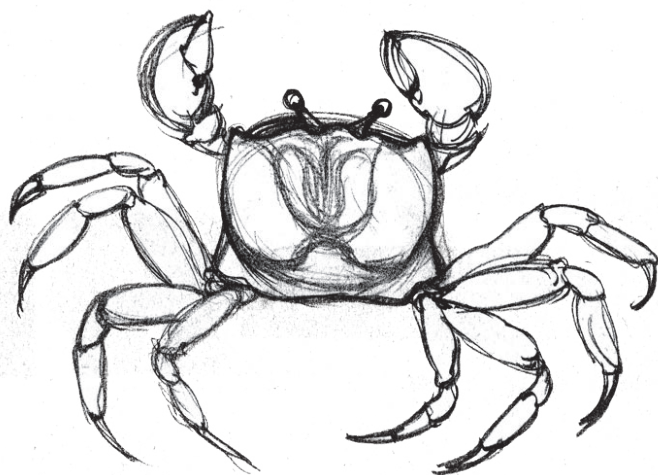
1. Long periods of exposure to air, heat and lack of water during low tide
2. The intertidal zone is a highly turbulent area. It is continuously disturbed by the action of the waves, constantly moving the sand.

Many of you would have felt this while standing in water on the beach. When the wave recedes, we feel a large amount of sand being carried away from under our feet.



Adaptation to exposure due to low tide

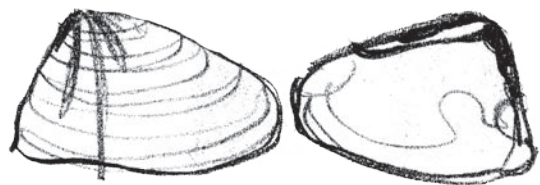
Ghost crab



In order to tolerate exposure to air some creatures like the ghost crab burrow deep into the sand to remain moist.

Some other creatures live in shells.

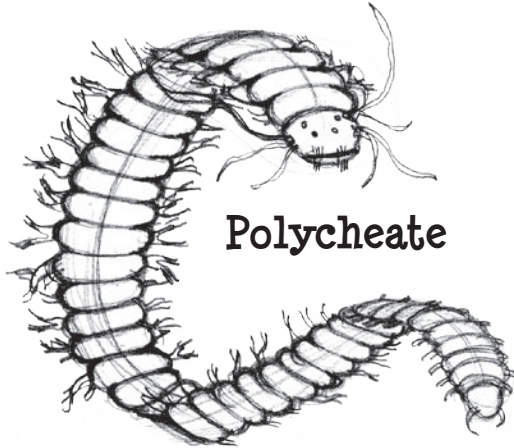
They close their shells tightly during low tide which helps them retain water inside. The shell also prevents water loss from evaporation.



Bean clam

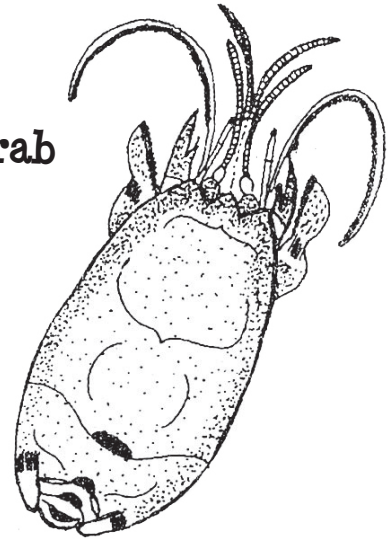
Adaptation to instability due to wave action

Some animals have developed a slender thread-like body, with numerous feet that enable them to move and dig easily in the sand.

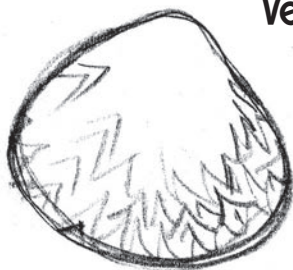


Polychaete

Mole crab



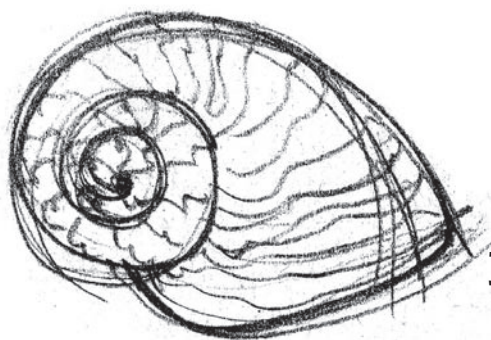
Some others have short bodies and powerful scoop-like modified hind-legs that allow them to dig quickly into wet sand.



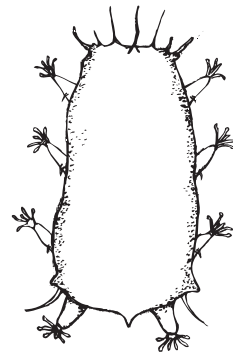
Venus clam

Some animals have smooth shells that reduce resistance while burrowing.

Some creatures have a large, spreading, extensive foot that acts as a suction device and helps them glide effortlessly over sand without getting disturbed by wave action.



Lined moon shell



**Tardigrada
(Battillipes)**

Some animals are so tiny that they are smaller than the grains of sand they live in.

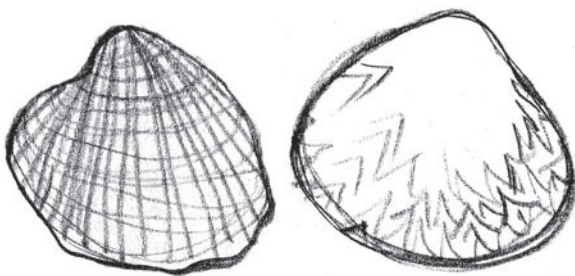
The Tardigrades have adhesive discs on their feet, with which they cling onto grains of sand so that they are not washed away.

Shells

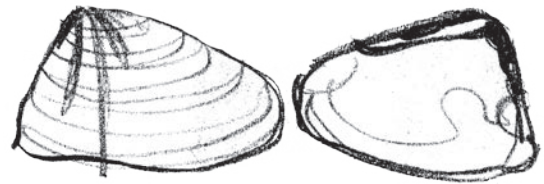
Sea shells are the hard protective covers, made by creatures that live inside them. Though the shell is hard, the creature that lives inside is very soft and fragile. Shells are made of calcium carbonate. They provide protection, and in some cases help the organism float. Shells come in various shapes and sizes ! Given below are some common kinds of shells found on our sandy beaches.

Did you know that collecting shells is a major hobby for many people and some rare shells are very costly?

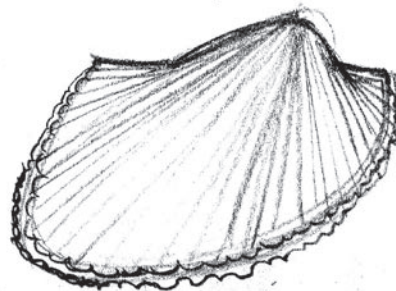
Venus clams



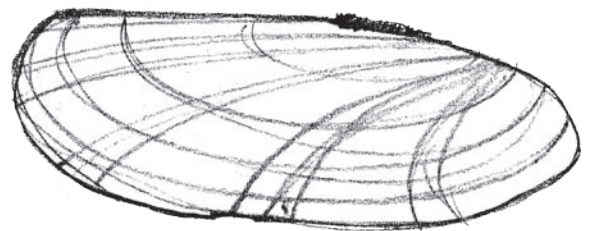
Bean clam



Ark shell

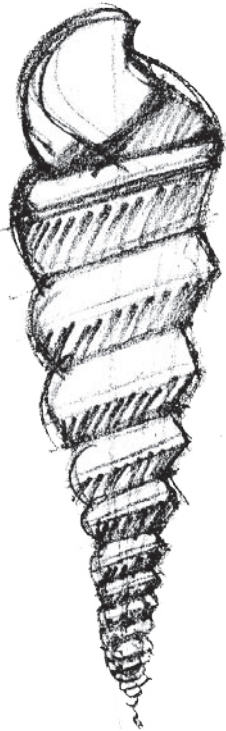


Sunset shell

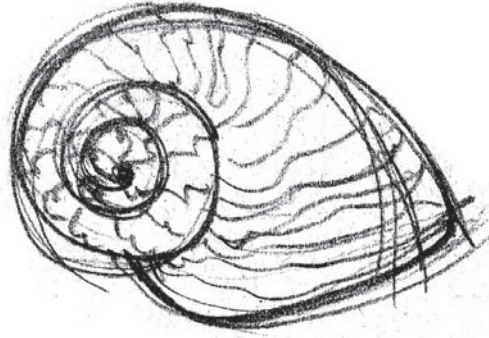


The above shells are 'bivalves'. They consist of two shells or valves hinged together. Bivalves are found buried in sand, hidden in cracks in rock or attached to hard surfaces. Most of the bivalves on the beach burrow into the sand and feed by taking in water from one tube and letting it out by another. The water is passed over a fine filter which traps the tiny particles and creatures on which the bivalve feeds.

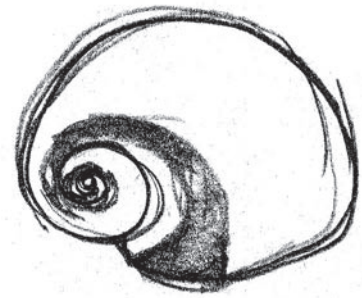
Screw shell



Lined moon shell



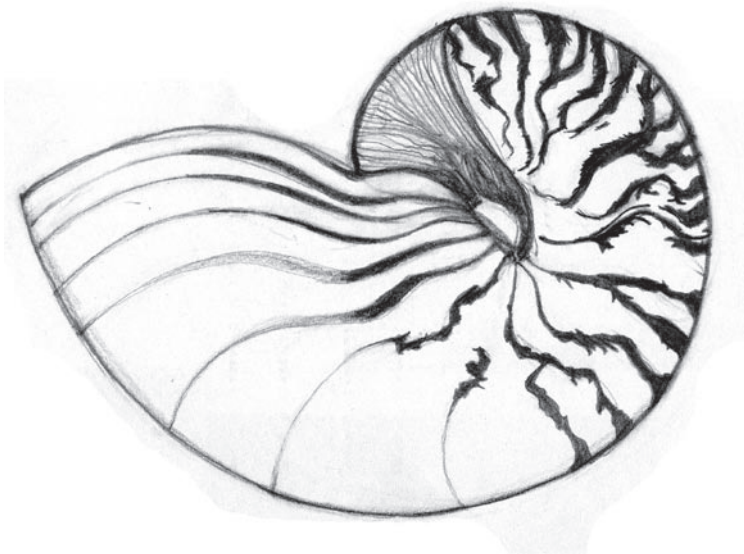
Tumid shell



Gastropods do not have two valves. Their body is composed of a single shell, which more often is coiled into a spiral shape. The shells are often coloured in various colours and shades. Their patterns of colour, different shapes, sizes and intricate architecture are all Nature's wonders.

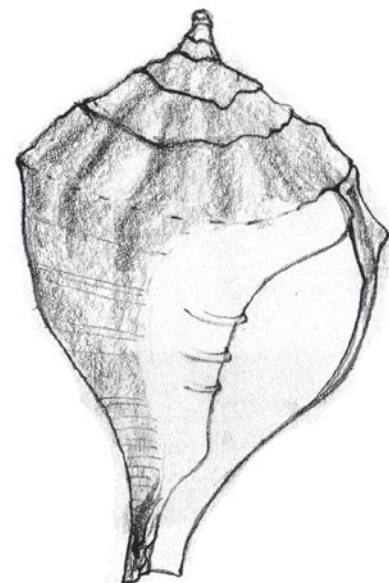


**Melo melo
(Beggar's bowl)**



Nautilus pompilus

Did you know? Although the Nautilus shell looks like a gastropod, it is more closely related to the octopus!



**Turbinella pyrum
(Sacred chank)**

ACTIVITY

7



Shell search !

Visit the beach and collect as many different kinds of shells as you can. If there is a rock, seawall or other structures on the beach, look on and around them.

Categorise the shells based on their shapes, colour & size. Put up a display of these shells in your classroom either in a glass cupboard or stick them properly on to a chart and hang them on the classroom walls.

1. How many different types of shells did you come across?

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2. How many of them are bivalves and how many are gastropods?

.....

3. Did you come across any live shell? How did you make out if it is alive or dead?

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4. Did you come across any shells with hermit crabs in them? (See the pic on page 23)

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6. Ask the fishermen what each of them is called in Tamil. Also ask them where they generally occur in the sea.



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7. Draw 5 shells you found interesting on the beach !

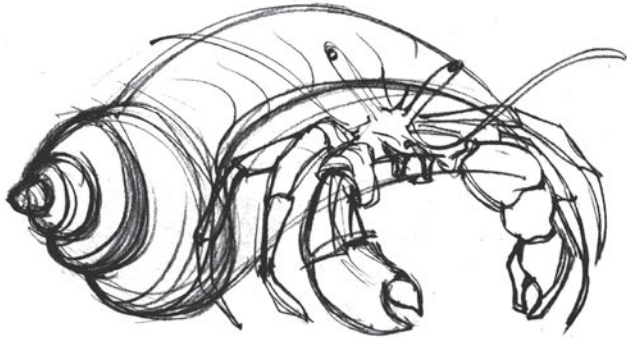


Remember!

- Do **not** carry **live** shells in your pockets. Some shells can be poisonous. Always put them in a container.
- Collect one shell of each type for the entire class and scatter the remaining shells on the beaches. (Hermit crabs may need them - learn more about them on the next page)

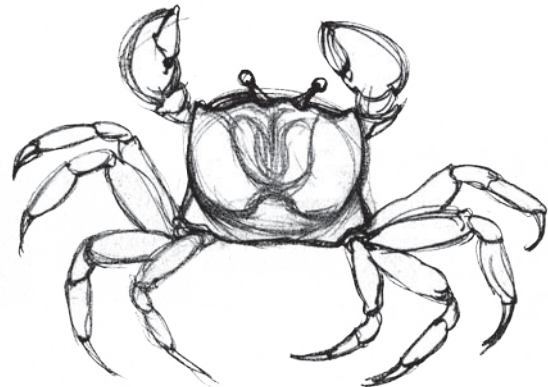
Crabs

Ghost crabs and some species of hermit crabs live above and close to the high-tide line. They come to the intertidal area to soak their gills, and also store some water which helps them breathe for a long time.



Hermit crab

Hermit crabs live in dead gastropod shells to protect their soft abdomen. They are a delicacy for many fishes and birds. As a hermit crab grows, it leaves its old shell and finds a new, larger shell.



Ghost crab

Ghost crabs are shy and usually come out at night when there are no people around. They come out in large numbers. They clean the beach eating everything that they can digest. Watch out for their large claws if you try to catch them!

ACTIVITY

8



Draw the missing mole crab !

Another very commonly found crab species is the mole crab. Have you ever seen one ? What is it called in your local language? **Look at the photo above and draw a mole crab in the adjacent space.**

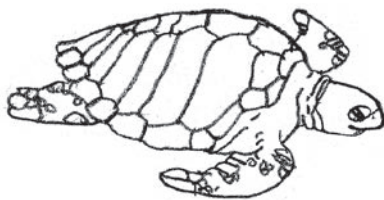
Mole crab

Turtles

Sea turtles spend most of their lives in the sea, but must come ashore to lay eggs. The eggs take about 7 – 10 weeks to hatch and hatchlings emerge at night. They quickly find the sea by locating the brighter horizon, which is seawards due to the reflection of moon and starlight on water, and due to the presence of silhouettes created by dunes and vegetation on the landward side. Thus sandy beaches and dunes are critical habitats in the life cycle of sea turtles. Olive ridley turtles nest throughout the mainland coast of India. Leatherback, Hawksbill and Green turtles nest in the Andaman and Nicobar Islands.

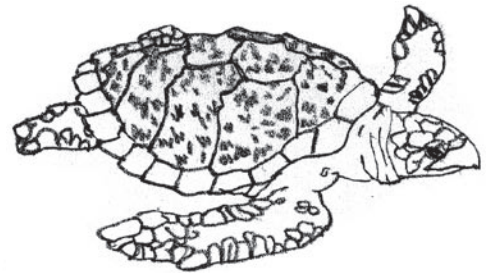
Olive Ridley

Smallest of turtles found in TN, weighing around 35 kg. Feeds on jellyfish, shrimps, crabs, and snails.



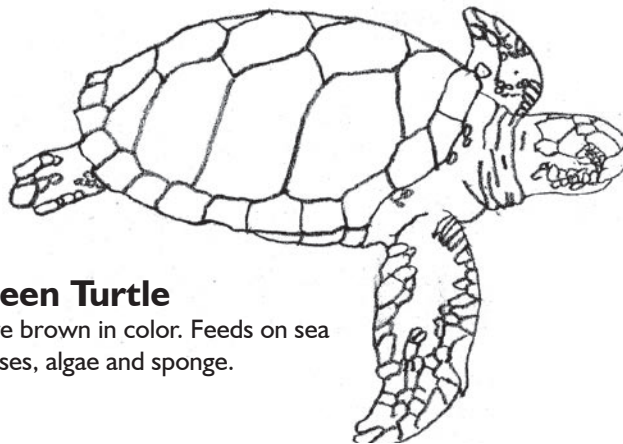
Hawksbill Turtle

Beak like a hawk. Lives in coral reefs and eats sponge. Shell made of yellow and brown overlapping scales. Head and flippers are gold with brown patches.



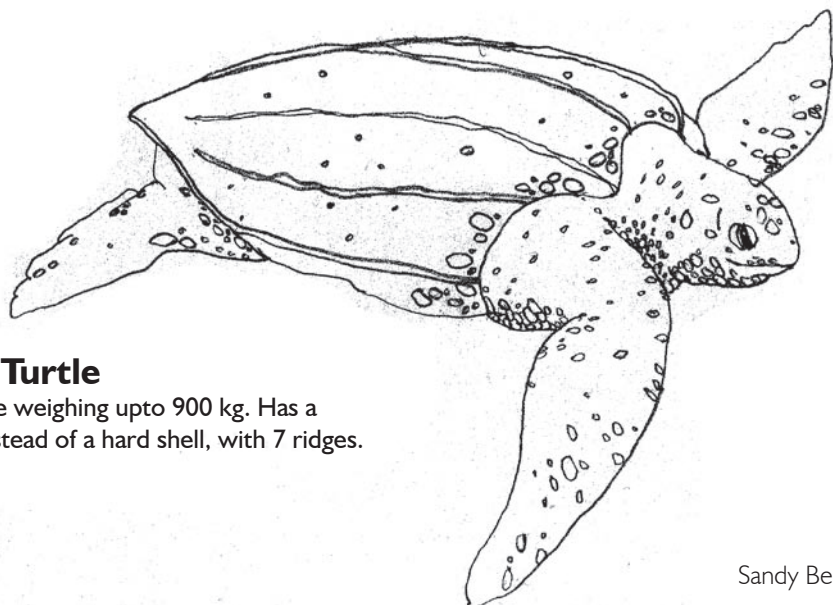
Green Turtle

Olive brown in color. Feeds on sea grasses, algae and sponge.



Leatherback Turtle

World's largest turtle weighing upto 900 kg. Has a leathery covering instead of a hard shell, with 7 ridges.



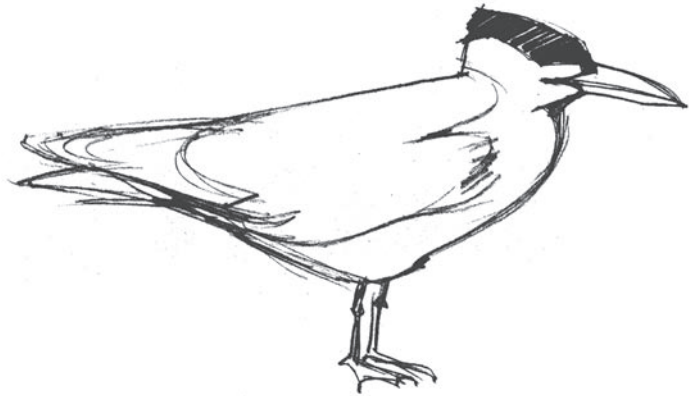
Birds

The beach attracts many specialised birds.

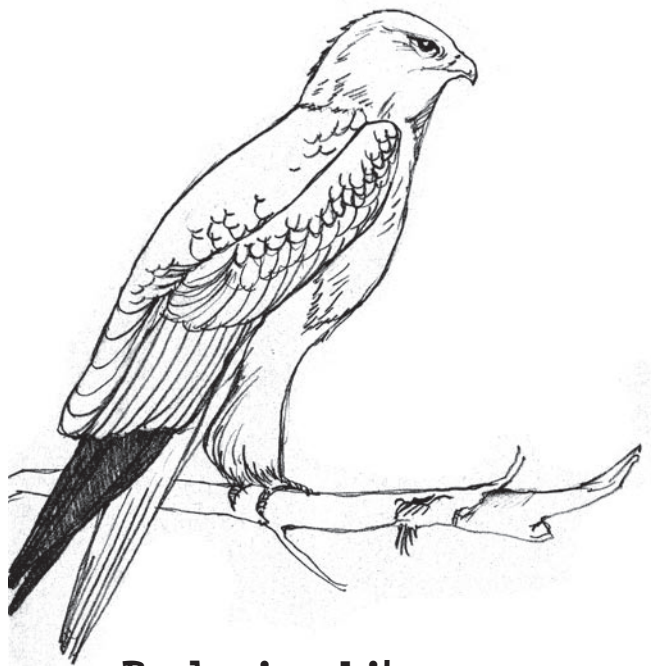
Some common birds found along sandy beaches are shown below.



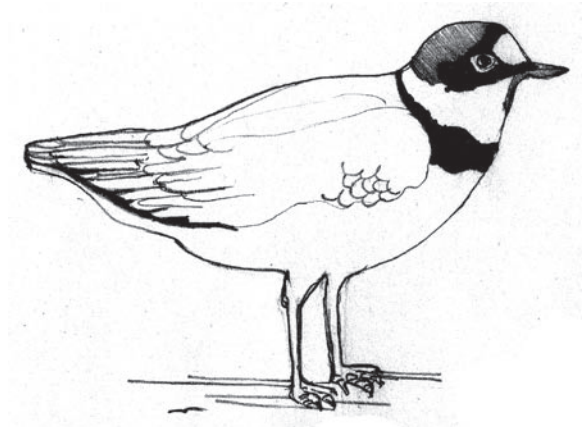
Common tern



Caspian tern



Brahminy kite



Little ringed plover

ACTIVITY

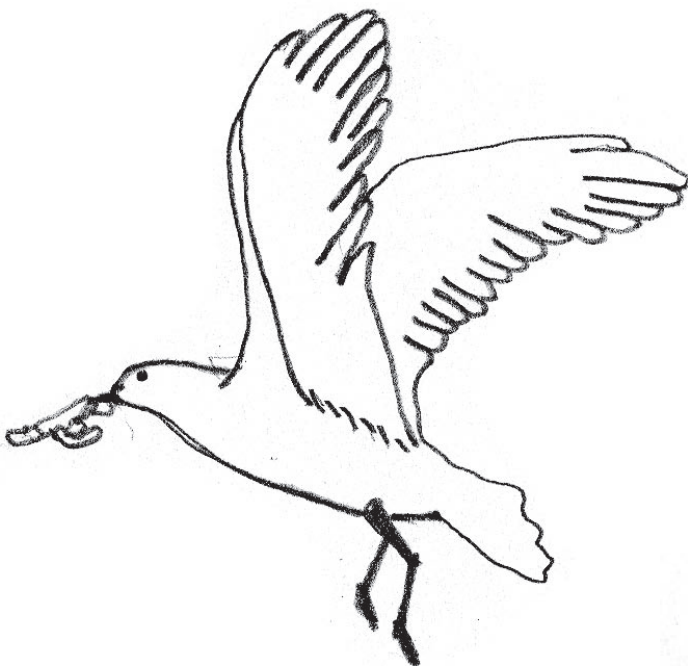
9



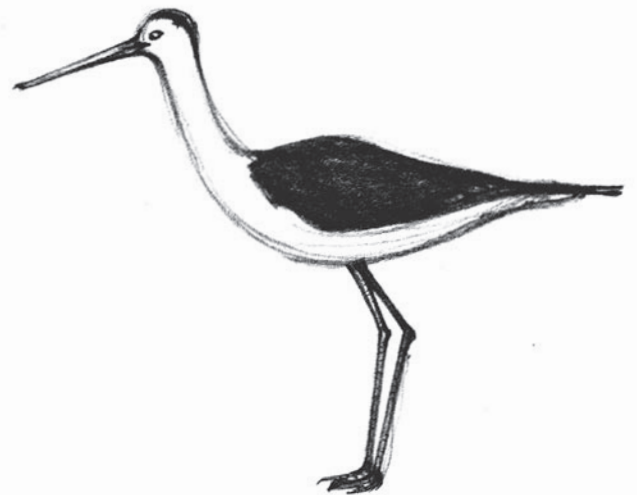
What are the birds upto?

Visit the beach and spend some time watching the bird life found there. Make a note of the following:

- Do you find birds in specific parts of the beach?
- What are they upto?
- What time of the day are they seen more commonly in the mornings or any other part of the day?
- Is there a particular part of the year that you see them more?
- Do they resemble any of the birds that you see in the book?



Sea gull



Black winged stilt

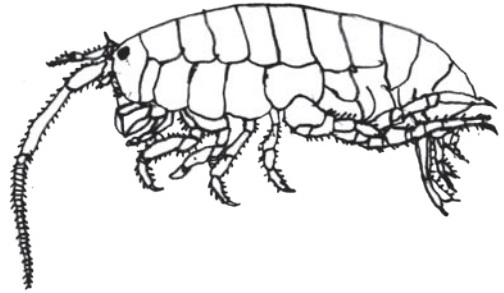


White bellied sea eagle

Other Interesting Creatures on the Beach

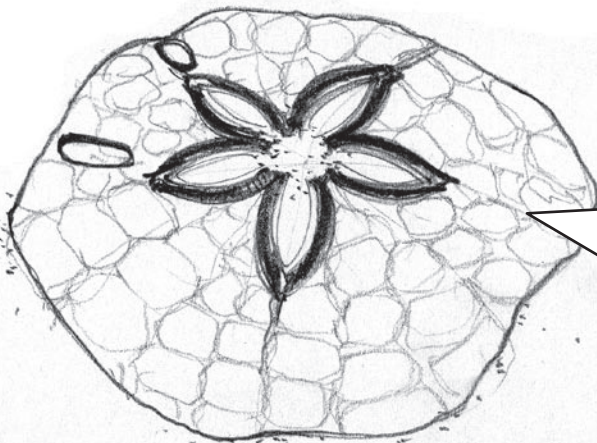
I am a Talitrus

I live in the sand just above the highest point to which the waves can reach. They call me “nocturnal” which means I prefer to come out of my burrow only during the night. This is to avoid the birds that love to feed on me and to escape the excessive heat of the sun during the day. When it is low tide at night, I go around feeding. I rarely return to my old burrow and instead use old or abandoned burrows of other organisms, which helps me save precious energy.



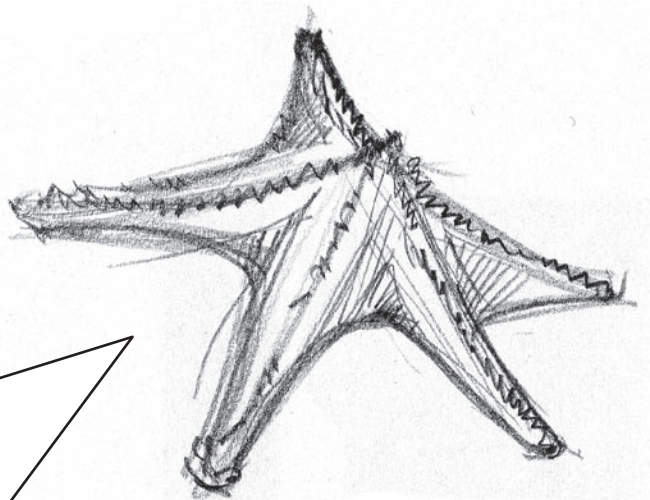
I am a Sand Dollar.

I look very much like a flattened plate. I have petal like shapes on my back. I have thousands of small feet - turn me over and see! I dig shallow just below the low tide. I am brittle.. handle me with care



I am a Star Fish.

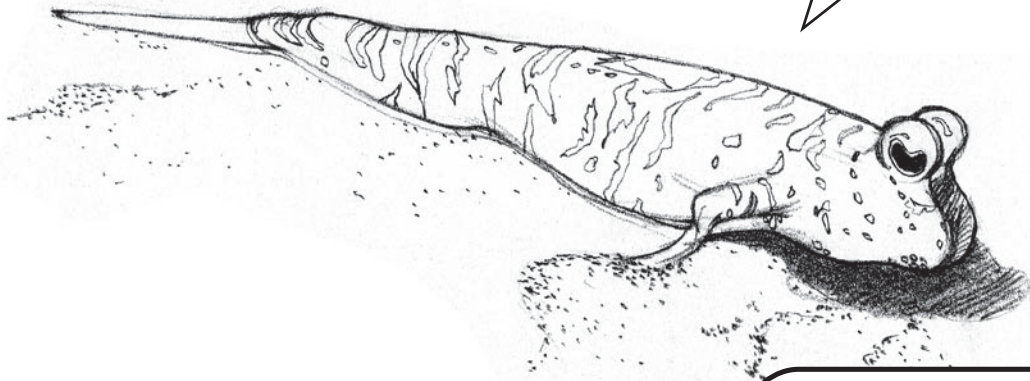
I live in shallow waters, not right on the beach, but you can still find us there. I often get caught in nets and get thrown on the beach. I have five arms and look like a star. I also have amazing powers of regrowing when injured. If I loose one of my five arms, even two or three, I can grow them back... in a matter of months...



I am a Mud Skipper.

Many say I am queer looking... so what? I am unique - the only fish that is happy above water. I do not live on beaches with lot of waves, but prefer quiet beaches and tide pools. I love mangroves.

I have eyes on stalks, and they help me keep an eye on everything. You won't be able to sneak up on me ever! My fins in the front are developed into hand like things that allow me hop on land.

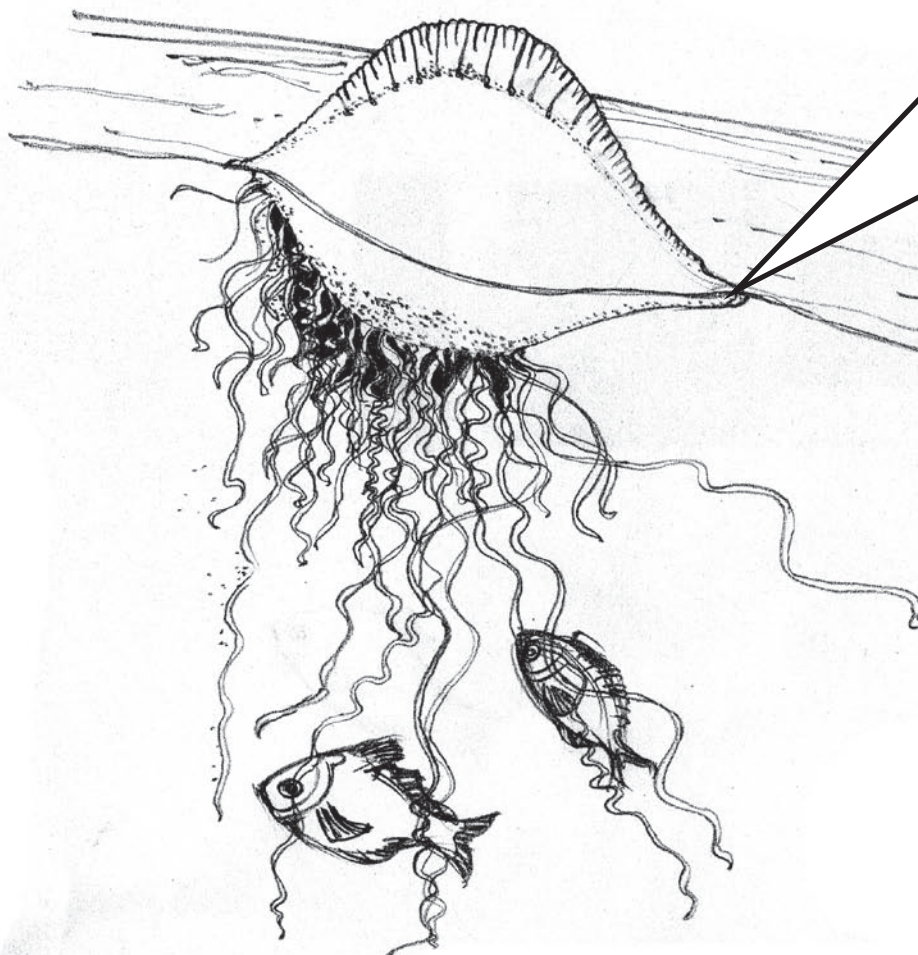


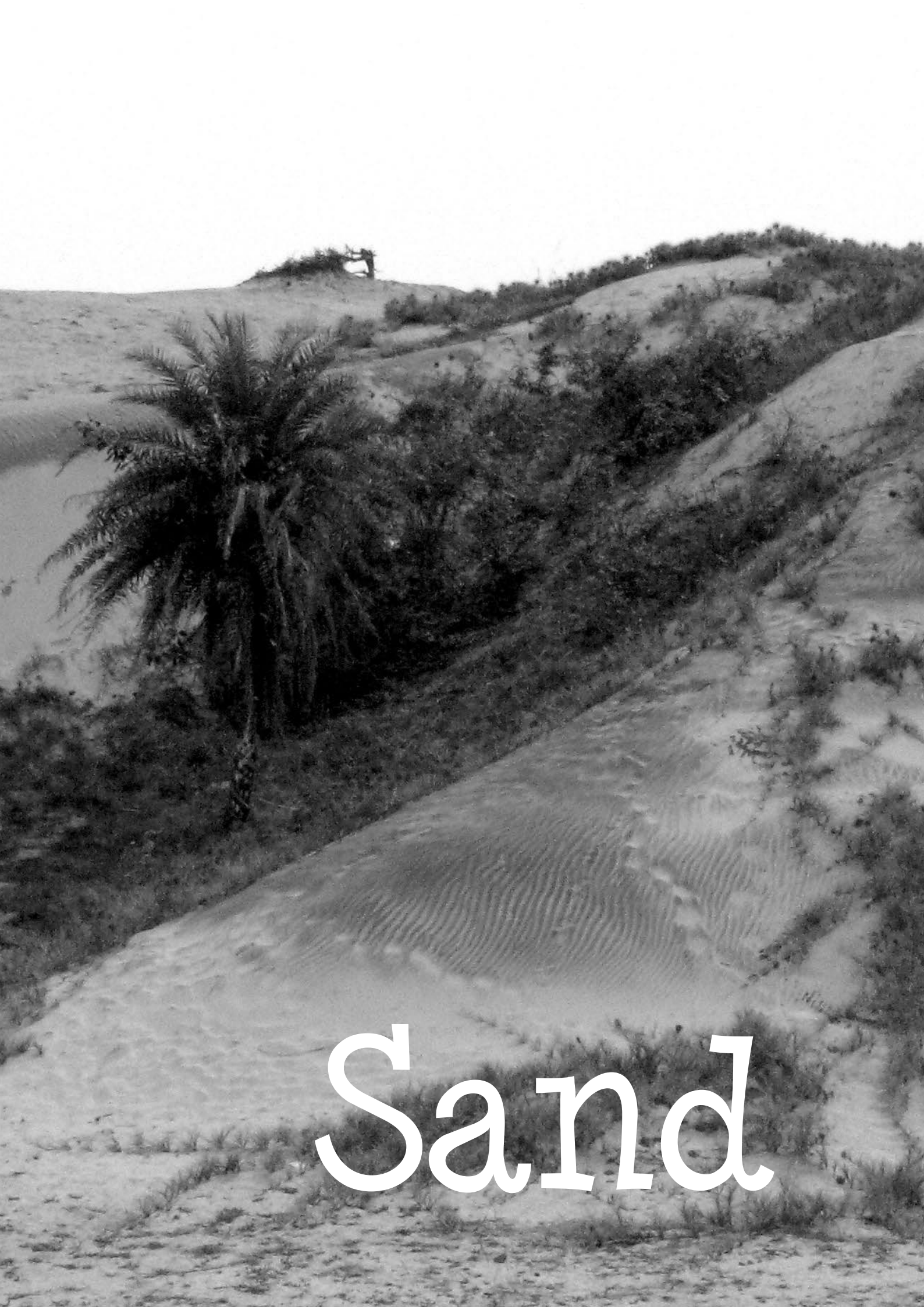
I am a Jellyfish.

I don't live on the beach. I drift around in the sea, at the mercy of the water currents. I don't swim actively, and therefore may get washed onto the seashore. Turtles love to eat me, but beware - I can STING!

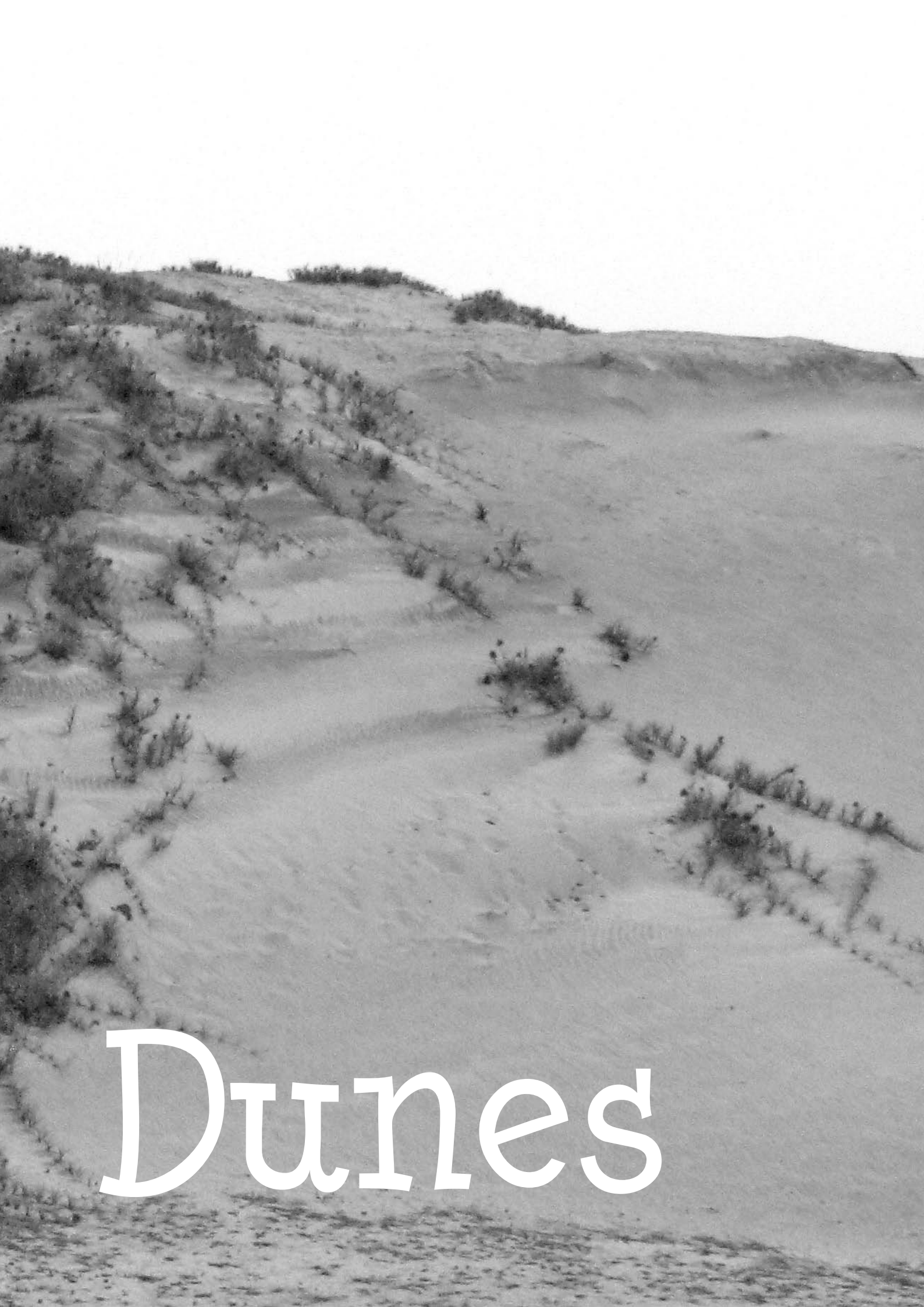
So don't mess around with me.

My body is made 90% of water and I have a large bell that helps me float. If u hold and lift me by this bell, I am quite harmless...





Sand



Dunes

5. Sand Dunes

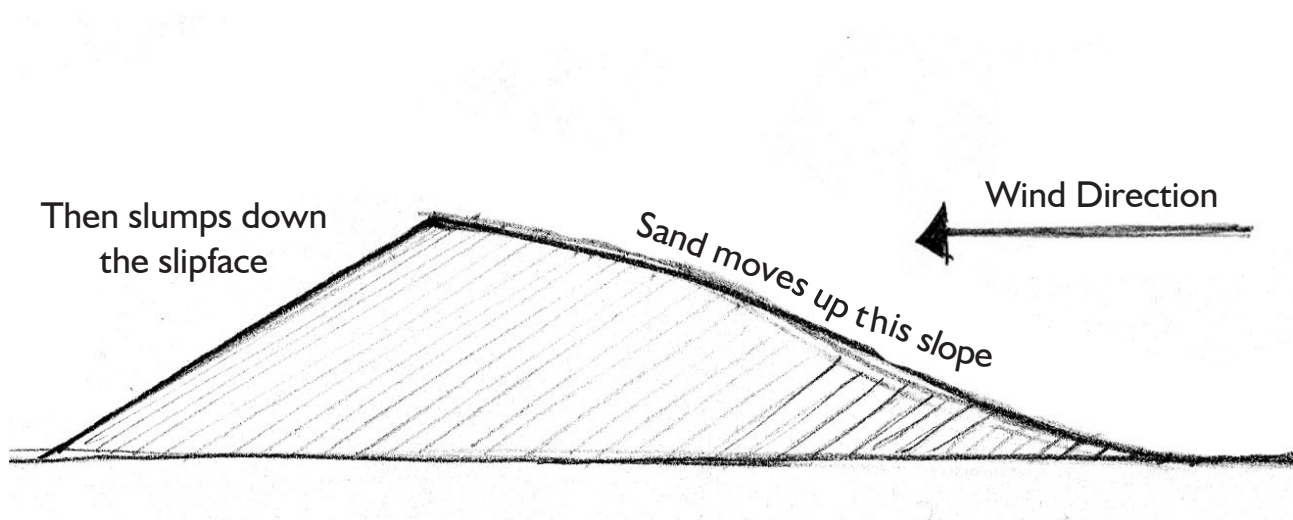
What are Sand Dunes?

Large mounds or hills of sand found close to beaches are called sand dunes. They are in fact extensions of the beach into the land. While a beach is closely linked to the sea and controlled by waves and tides, the dunes are linked to land and are controlled by winds.

How do they Form?

Three things are needed for dune formation: a large supply of sand, wind speeds capable of moving grains of sand and an ideal location for its accumulation.

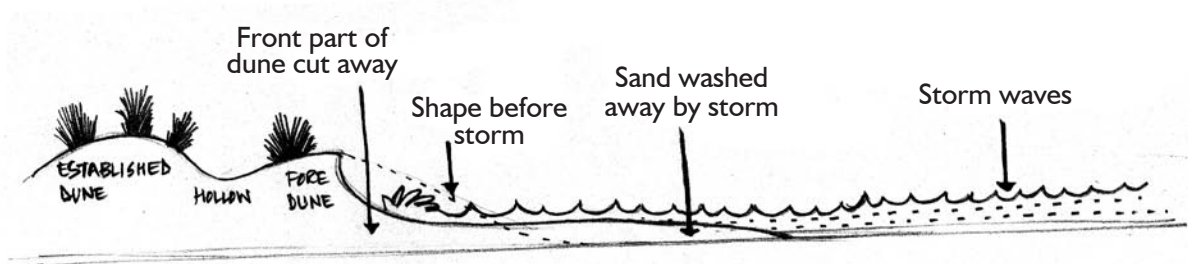
Generally dune sand is fine sand from the beach that is blown inland by the winds. Dunes are formed when the sand brought in by the wind is trapped by plants or other obstacles. Small mounds formed by sand, which is trapped, gradually expand to form dunes.



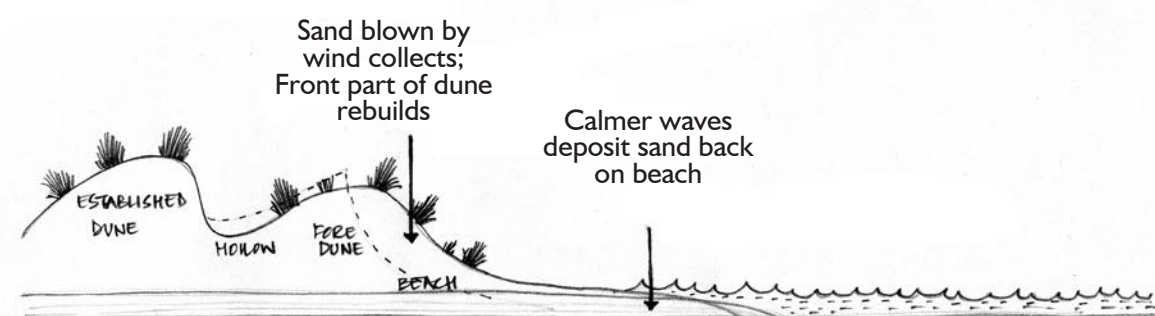


The same winds that are responsible for the formation of the dunes can also lead to their destruction. If the winds blow too hard as is the case of a cyclone, large waves are created, that destroy the beaches and the front part of dunes. However once the wind comes back to its normal speed the process of dune formation will recommence.

1. Beach erosion during storm

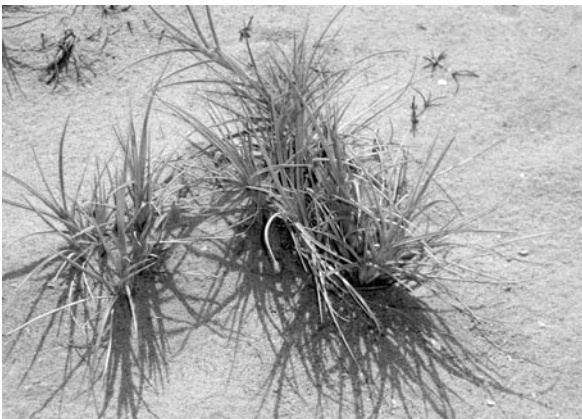


2. Beach & dune repair after storm





Ipomoea



Spinifex

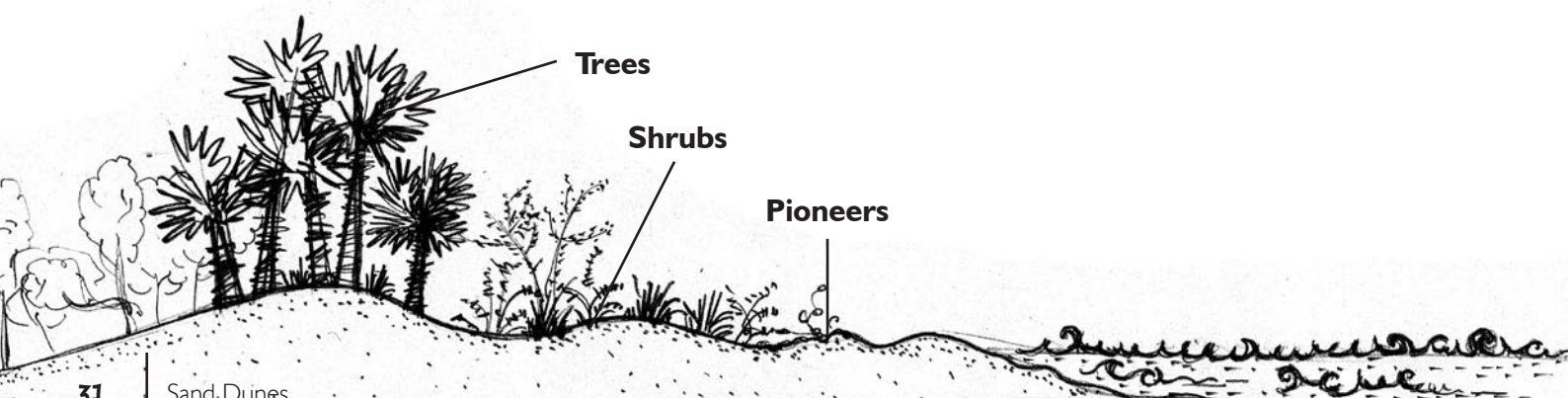
Dune Flora

Plants play a very important role in dunes because they are directly responsible for establishing dune structures. Conditions on dunes are quite similar to deserts making life here hard. Some of these conditions are :

- High amount of sand moved around
- Salty winds blowing in from the sea
- Exposure to very high temperatures
- High speed of winds
- Very little fresh water available

In dune systems plants are present in three zones and show characteristics to confront these conditions.

1. Pioneers : Plants closest to the sea, made up of mostly creeping grasses with fleshy leaves and stem. Pioneer plants have adapted to the harsh conditions on dunes by having rapid growth to outpace sand accumulation, fleshy parts to store water, roots that reach deep into the sand in search of water and even a creeping nature that helps them to creep over shifting sand. The most common pioneer plants are the runners *Ipomoea pes-caprae* (Goat's foot convolulus/Attukal) and *Spinifex* (*Ravana meesai*).



2. Shrubs

This includes a mixture of plants from the pioneer zone and shrubs. They face moderate sand movement and lower salt loads, though temperatures remain extreme.

Prosopis (Karuvai) and Cacti (Kalli) are some of the species found in this zone.

Examples of Shrubs



Cacti

3. Trees

Trees grow behind the shelter of large dunes in areas of good rainfall. The development of the forest can take very long and needs special conditions of soils, moisture, humus and protection.

Anacardium oxydentrum (Cashew /mundri), *Tamarindus indica* (Tamarind tree/ Puli maram), *Borossus* (Toddy Palm/ Pana maram) and *Pandanus* (sp.) are some common trees that do well on dunes.

Examples of Trees



Palm



Pandanus

Dune Plants & Humans

Many dune plants are used by humans for various purposes- some serve as vegetables, some are medicinal, some are used as fuel and some are used as raw material to build with.

ACTIVITY

10



Plants we Use !

Speak to your elders at home and list out five different plants that grow locally on dunes and what they are used for.

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Exotic Plants

Plants that are not locally available, but brought from other regions are called exotic plants. Various species of plants have been introduced to sand dunes with good intentions but have become highly problematic. *Casuarina* (savukku maram) and *Prosopis* (karuvai maram) are two such species. These two species outgrow our native varieties of plants.



Casuarina



Prosopis

The Palmyra Tree and its Uses

The Palmyra tree is found very commonly on the landward side of sand dunes. Different parts of this tree are used in various ways. We have illustrated a few uses below.



Palm leaves used to make fences, sometimes along with catci

ACTIVITY



Useful Palms!

Is the palm tree found in your region? Look around and add to this list of uses.



Palm leaves used to line water pathways in fields to prevent them from eroding



Palm leaves used as thatching material



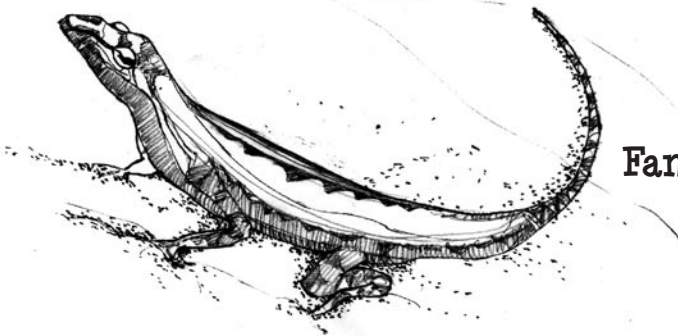
Palm stem used for fencing

Dune Fauna

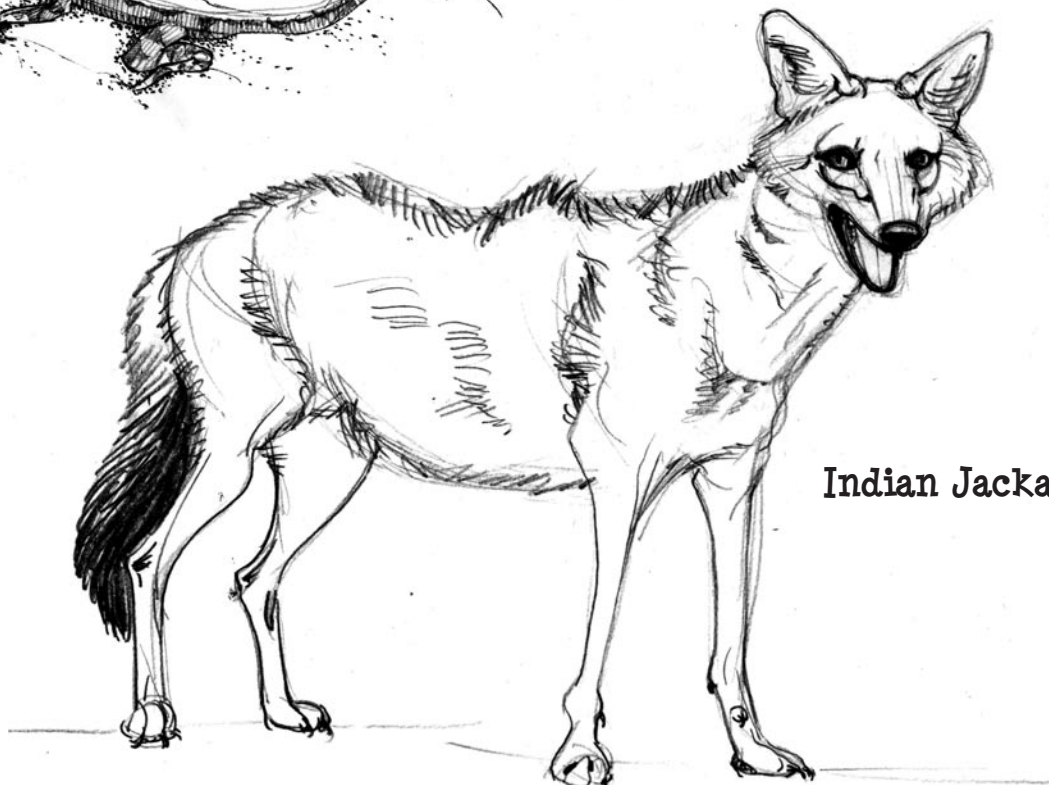
Large fauna are rarely seen on dunes. Many species of lizards, beetles and bugs are specially adapted to life in dunes. Some small mammals like voles, mice, hares and foxes have been reported from sand dunes. Reptiles, amphibians and some bird life are also present. The Blackbuck is a native antelope of India and is found in the dunes and coastal forests of Point Calimere.



Skink



Fan-throated lizard

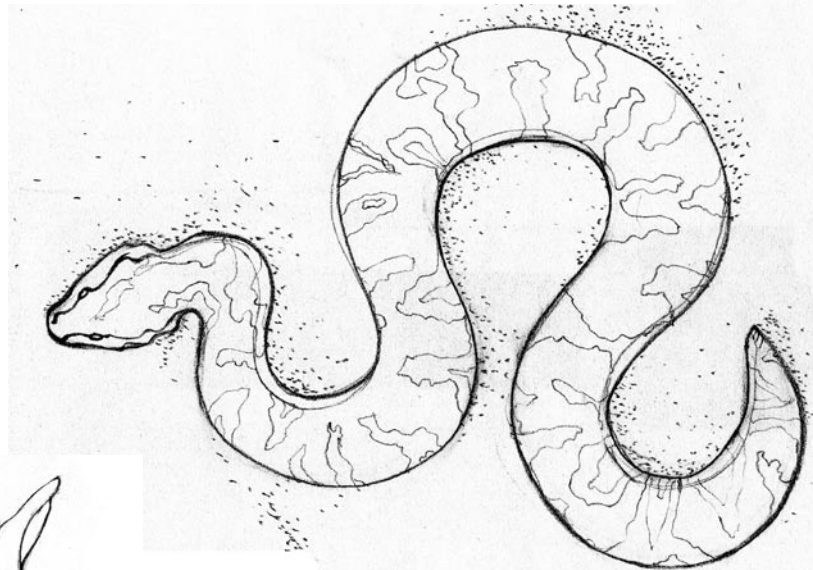


Indian Jackal

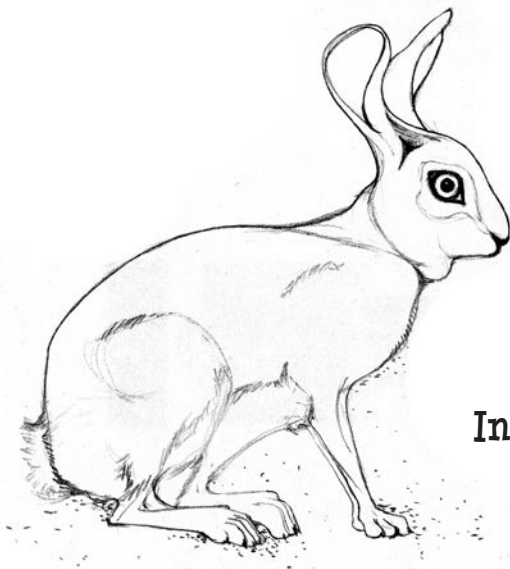
Blackbuck



Sand Boa



Indian Hare



ACTIVITY

12



Find the sandy creatures !

Colour the beautiful seaside picture !

How many of the following can you find hidden in the peaceful scene ?

1. Olive ridley turtle
2. Palm tree
3. Starfish
4. Sea gull
5. Nautilus
6. Little ringed plover
7. Jellyfish
8. Crab
9. Ark shell
10. Moon shell
11. Black winged stilt
12. Giri !



ACTIVITY

13



Sandy explorers !

Like in the picture below, beaches and sand dunes upon first glance don't seem to have many living things on it. The aim of this activity is to discover just how many living things you can find when you are observant.

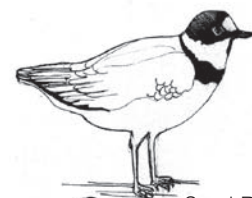
Materials : Pen, pencil and paper to record what you see. A bucket to collect samples whenever possible.

Time: One hour

Break the class up into two groups - Beach Combers & Dune Climbers. One group studies beach life and the other studies dune life.

Write down every animal and plant you see while on the expedition. If you don't know the name of the living thing, write down a description, or draw a picture of the living thing for identification later. The goal is to be alert, quiet, attentive and to look for living things. The objective of this activity is to become more observant.

Before beginning their exploration each group should guess and write down how many living things they think they will see. It will be interesting to look at this number later on!



ACTIVITY 14



My beach & dunes

Draw your beach and dunes as you see them.

Use the entire page, make it colorful & have fun with it. Next identify and mark on your drawing the following:

- 5 different **plants** & where they are found
- 5 different **animals** & where they are found
- 5 different **birds** & where they are found
- 5 different **human activities** & where they usually occur







6. Importance of Sandy Beaches and Sand Dunes

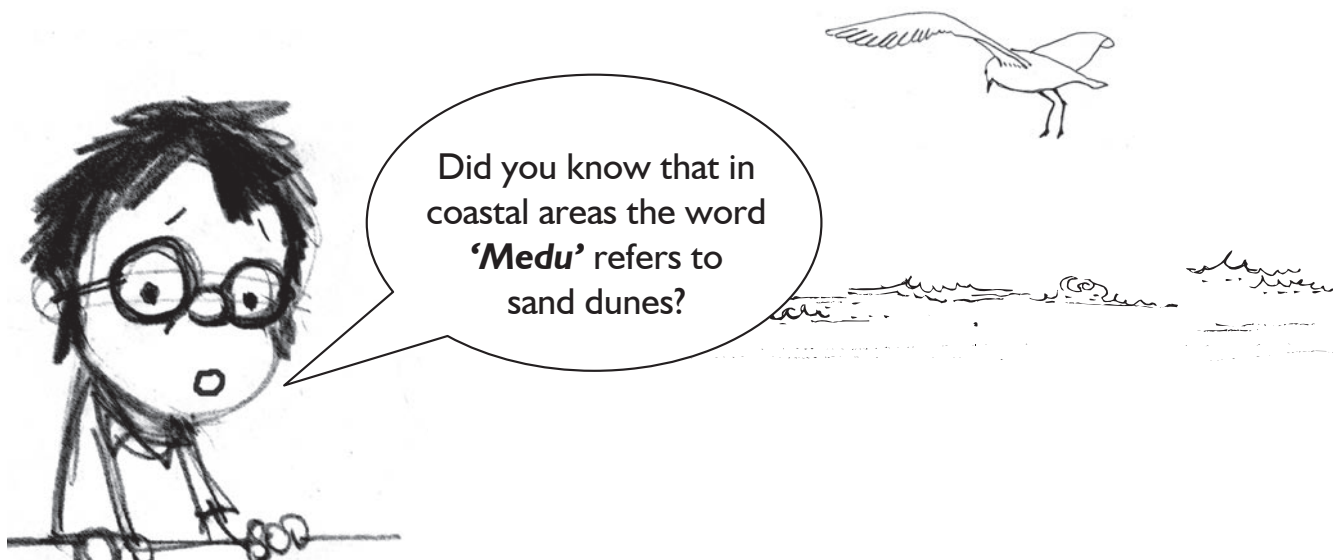
The seas we live next to get violent every once in a while and powerful storms and huge waves lash our coastline. Have you ever wondered why these waves don't reach your home every time there is a storm? The sandy beaches and the mounds of sand called sand dunes could be the answer. Sandy beaches and dunes are the sentinels of the coast. They act like shields that bear all the heavy impacts of the waves and prevent the furious winds from destroying homes and crops. They also prevent the seawater from entering into wells and ponds. Imagine what would happen if you get salt-water from your wells. They also protect us from salt laden winds that could cause serious damage to crops and buildings. Beaches are also ideal places to get some fresh air, play around with friends and explore. What better place to spend an evening than on the beach? This space is also valuable to everyone who depends on fishing for a living. Is it not here that our fathers haul the boats and keep it out of the reach of the sea? Is it not here that they sit and mend their nets? Chat? Play cards? Is it not here that our mothers wait for our fathers, scanning eagerly the horizon wondering when they will come with the fish. Is it not here that they auction the fish, sell it to company owners? Is it not here that the fishes are laid to dry?



A fishing boat setting off to sea



Fish being cleaned on the beach



Many villages on the coast like Kottucherrimedu, Kottaimedu, Chinnakottaimedu, Kilinjal medu, etc. are names of villages situated on dunes. When the December 2004 tsunami hit our coasts, many such villages on dunes were saved, because they were built either behind the dunes or on top of dunes. After the incident, the people began realising the value of dunes and many villages are now trying to protect their dunes and to bring them back to their earlier state.



Count the Medus!

How many more villages do you know of that end with 'medu'? List them all. Are they all situated on or next to coastal sand dunes?

If you ask your parents and grandparents, they may tell you stories of "kolams" or human-made ponds in and around the village. Water for drinking and for all other purposes came from these kolams. The sand dunes actually help in storing and supplying water to these kolams. They are Nature's own water supply systems. Thanks to the availability of water and protection from winds from the sea, agriculture (even paddy cultivation) is done behind sand dunes in Tamil Nadu.



A typical fresh water kolam



Farming activity behind dunes



Paddy cultivation right behind a beach

ACTIVITY

16



How we use our beach

Interview a fisherman from your village to understand in detail how his community uses the beach area & what it means to them.

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[illegible]

7. Threats to Sandy Beaches and Sand Dunes

We have seen how important sand dunes and beaches are not just for the coastal people, but also for a wide range of animals and plants. Sadly, like every other ecosystem in the world, there is a danger that we might lose these. When an activity or event can destroy a sand dune, that activity is called a “threat”.

Threats to sand dunes and sandy beaches are of two kinds - natural and human-made. Storms, winds, cyclones or earthquakes are natural threats. However, most ecosystems are used to these and often learn to adapt to these. Sometimes human actions can cause much more damage, especially when there are both human and natural threats. The story of the beach called Digha in West Bengal is a good example. Here humans changed the sand dunes so much that there was no barrier for the sea water which entered and finally destroyed homes and even some hotels. The climate around us is also changing a lot. This is because of the number of trees we humans cut and the amount of smoke discharged from vehicles and industries. This causes so many changes in the winds, seas and the weather that it can even change the shorelines. Scientists tell us that sea levels will rise as our planet gets warmer. This will lead to a greater erosion of the coastline. Frightening isn't it?

Here are some direct human-made threats to sandy beaches and dunes:

Sand mining:

Beach and dune sand is heavily mined for the construction business although there are rules that don't allow this. Along with this mining activity is the movement of trucks over these sensitive ecosystems. This results in their destruction. Did you know that beach and dune sand is high on salt content and it should actually never be used for construction purposes?



Sand Mining



Mineral sand mining

Mineral mining:

Some of our beach and sand dune areas have deposits of important minerals. Such mining is different from sand mining for construction and is highly destructive to the dune and beach system. It has caused serious erosion along these places.



Sea wall

Hard protective structures like seawalls:

These can mean very bad news for our sandy beaches and dunes. They block the sea and prevent it from meeting the beach areas. This means seawalls actually prevent the sea from depositing its sand and other material on the beach. We have read earlier that this is exactly what causes beaches to grow! It is very important that the sea and the beach get to meet each other for the shaping and growth of both beaches and dunes. If the sea is prevented from making such deposits on the beach, then the dune flora and fauna also suffer. Our sand dunes might become weaker and more vulnerable to destruction.



Laying a sea wall

Human habitation: Increasing human population has led to more houses and constructions along the coast. Many of these settlements happen on sand dunes. This is a major threat to dune ecology and structure.



Concrete construction on a dune



Human habitation on a sand dune

Tourism development: Tourism development on the beach involves a lot of construction. At times buildings, swimming pools and roads are made after razing and digging out dunes and tons of sand.



Tourist activity on a beach



A sand dune being razed

Transport routes – roads, railways, bridges: Infrastructure like this could not only destroy dune structures but can lead to greater development and construction which will destroy our ecosystems. This weakens the protection that beaches and sand dunes offer to inland communities.



Laying a railway track



Garbage on beach

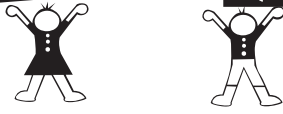
Erosion: Natural forces of the waves and winds erode and simultaneously build sandy beaches and sand dunes. Sometimes due to natural factors and now more and more due to human-made factors erosion is becoming a big problem.



Beach Erosion

However, it is possible to a certain extent to lessen the negative effects of human activities by better practices, sharing more information amongst the community and starting Protection and Restoration programmes. Let us learn how!

ACTIVITY 17



Keep your beaches clean!

Organise a beach clean up with your class. At the end of the exercise tabulate the different kinds of waste you found on your beach, its possible source & discuss its possible impacts. You can also organise a presentation for the community of your findings, along with an exhibit of the waste you found.

List the waste found:

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.



ACTIVITY

18



Change ! Change! Change!

Everything changes over time, and beaches and dunes are no exception. How have the beaches and dunes of your village changed over time? Interview elders in your village to understand what all has changed and why.

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8. Protecting and Restoring Sand Dunes and Sandy Beaches

Preventing threats:

We have learnt how valuable and important sand dunes and sandy beaches are to the coastal people. But how do we protect them? Prevention is better than cure!

First you need to find out what can destroy our sand dunes and sandy beaches. We've read about these 'threats' to our beaches. You can see which of these threats is present in your area - sand mining, building sea walls or pollution on the beach. You need to keep a record of these threats each time you see them. Is it possible to prevent this?

Let us look at an example: Garbage. How do we prevent garbage (or more garbage) from reaching the beach? Here is a list of things you can do:

- You can organise a 'beach clean-up' of whatever rubbish is there right now. You may have to repeat this again two months later.
- Ask the elders how to arrange for dust bins at different places on the beach.
- Get someone to help paint and put up sign boards about throwing waste on the beach. You can think of nice messages like, "It is your beach. Keep it clean!"

Bringing our dunes back to health

In many cases where the beaches and dunes are badly affected, just preventing the threats may not be enough to bring the dunes and beaches back to health.

We have to nurse them back to health. That is what the process of 'Restoration' is all about. It not only helps to bring back flora and fauna species, it also helps to protect agricultural land and human settlements from the destructive forces of the oceans.

Making dunes!

Dunes are created when sand is trapped. You can use a fence to create a dune! Fences made to trap sand help dunes to grow. These could be made of plants or could be ordinary material like wood or branches. These fences help the dunes grow and also remain healthy.

There are some important steps in Sand Dune restoration:

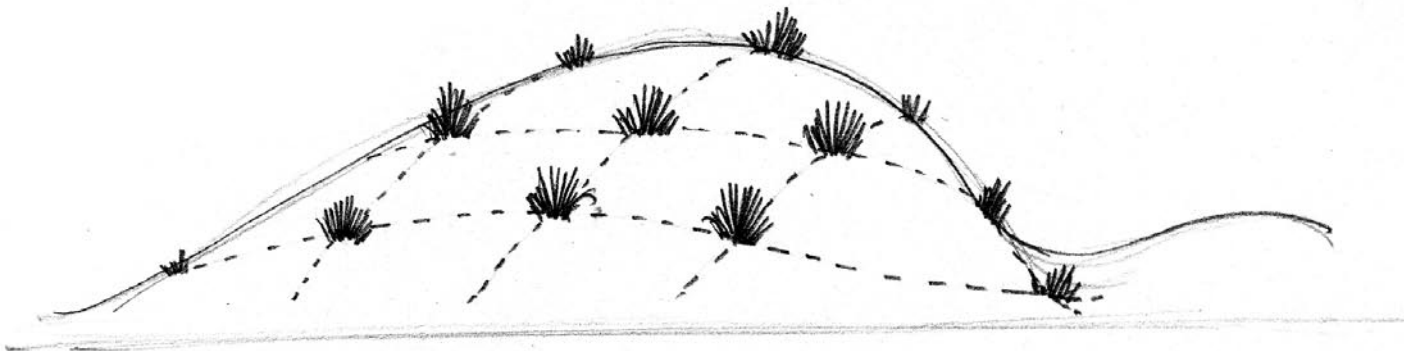
- Careful selection of the area to be restored
- Children and elders from the village must participate
- Fence creation
- Protection from cattle grazing, firewood collection
- Awareness amongst local communities
- Planting, watering and watching over of the plants

How to restore a sand dune

- **Planting:** Prepare a nursery of local, strong species that are salt tolerant. Plant these saplings in a checker board pattern (see the picture below) checker-board 1m square boxes on both the slope of the dunes facing the sea and the slope facing land. The part of the dunes facing the sea should be planted with lots of creeping plants like goat's foot convolulus (attukkal) and sand spinifex (ravana meesai). Local plant species like palm trees should be planted in the back dunes in parallel lines. Seeds of other local grasses and shrubs should be sprinkled to allow natural growth.

Important! Planting should be done in the rainy season and plants have to be regularly watered in the dry seasons.

- **Soil enrichment:** Add farm manure (like cow dung), coconut fibre or coir at the base of the pits. You can add kitchen waste which will help retain water and also provide nutrients to the plants.
- **Watering:** Plants should be watered at least once every week.
- **Fencing:** It is essential to fence off the planted area to protect the plants from curious cattle and humans!
- **Monitoring:** The plants should be examined every time you water them. Pay attention to each and every plant.
- **Participation:** For any restoration work to succeed the participation of children and elders is very important.



Checker board pattern of planting

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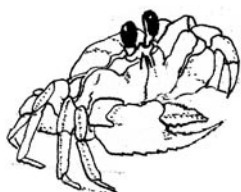
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Scribble Space!

Use this space to draw, put down your thoughts...
take notes... in any way you like!

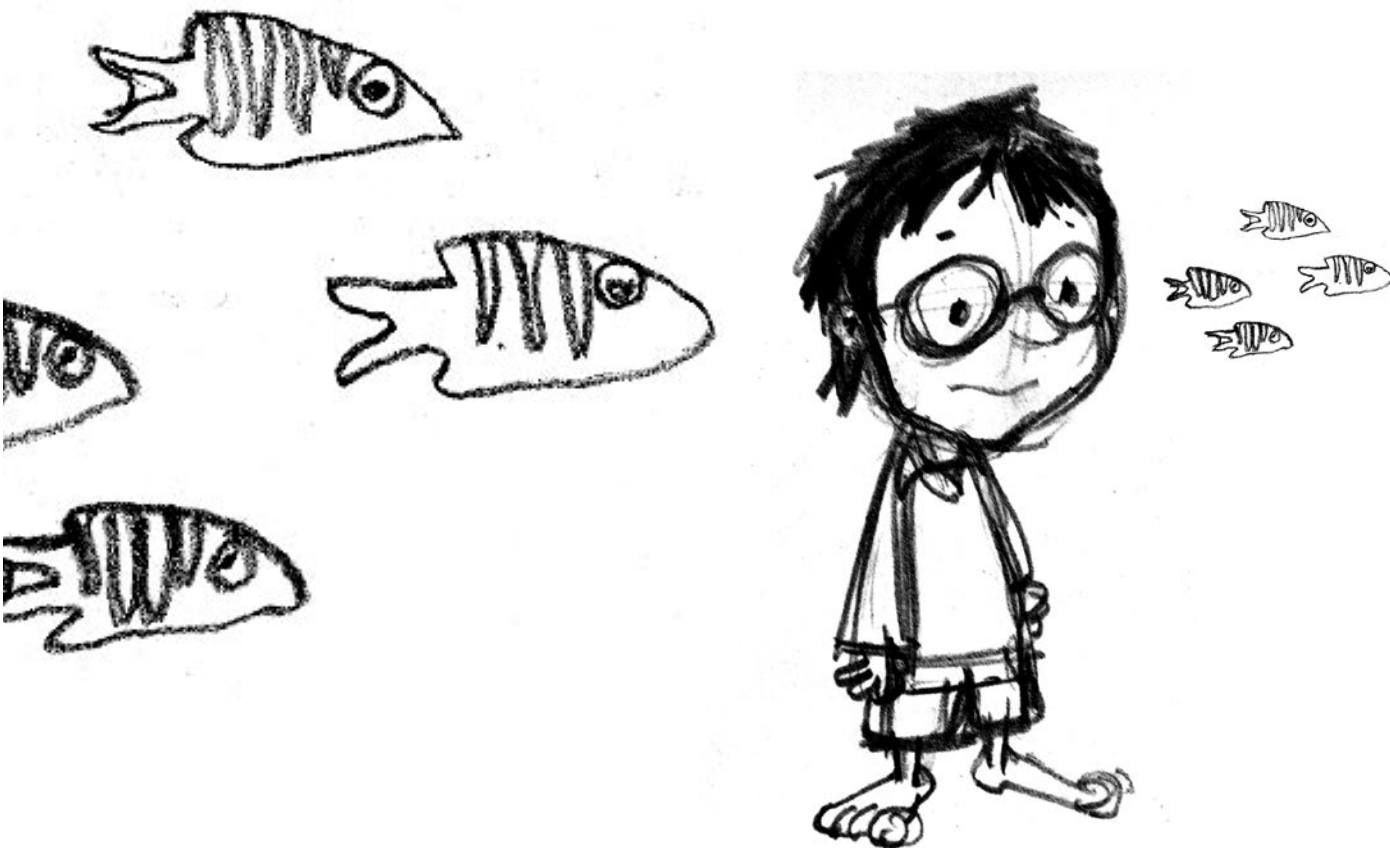




Scribble Space!

Use this space to draw, put down your thoughts...
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The Coastal and Marine Programme team at ATREE is interdisciplinary in nature and applies skills in the natural and social sciences in its research and conservation interventions.

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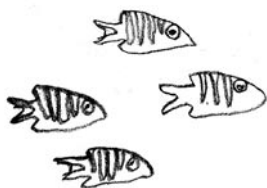
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After the December 2004 tsunami hit the south east coast of India, sand dunes and sandy beaches have received greater attention. They buffer the energy of the waves thus protecting coastal hamlets and prevent salt water intrusion into the hinterland. Information about their cultural, social and ecological significance to coastal communities is slowly being recognised. The Coastal and Marine Programme (CMP) at the Ashoka Trust for Research in Ecology and the Environment (ATREE) undertook a project titled "Post-Tsunami Environment Initiative" (PTEI), funded by the UNDP. As part of the project, a literature review was done to understand the existing baseline information and gaps in the study of sandy beaches and sand dunes along with many other major coastal and marine ecosystems. We felt that it was important to generate an interest and awareness about the significance of these ecosystems among the communities themselves. As first step towards this, we developed this book for children in rural schools on the coast.

The authors encourage readers to distribute the book, translate the same and also provide us feedback on its contents.

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